ELECTRICAL REVIEW

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Economic Balance

Power Essential to Industrial Recovery

LAST week's debate upon the economic situation ranged over a wide field, but on the whole kept within the framework of the recent White Paper on the subject. It was a general criticism of this document that while it set out our economic ills and suggested remedies in the form of minimum "targets," it did not state the methods by which these targets could be attained. In the debate some attempt to fill in this deficiency was made by Sir Stafford Cripps, who said that the Government staff for economic planning was to be strengthened and arrangements were being made for ensuring the co-operation of industry in the planning organization.

Joint Planning Staff

Each department concerned with trade, industry and economics was to have a whole-time planning staff. From these there would be formed a joint planning staff, under a full-time executive head, which would cover the whole field of forward planning. It would be specially concerned with the more immediate task of reviewing the 1947 programme.

Later in his speech Sir Stafford gave one example of a lack of balance in planning. He showed how, to meet the housing programme, the production of electrical appliances was very successfully stimulated at the same time as industry was being progressively electrified. The fact that there was insufficient generating plant to carry this increased load was apparently overlooked, as Mr. Oliver Lyttelton pointed out. Orders for plant should have preceded the production of appliances by two or three years, but at that time we were still at war and generating plant had to give way to tanks and aircraft. Moreover, much of the plant produced has had to be exported, largely to retain our goodwill abroad.

This is all well-known; what the House, the country and the electricity consumer in particular wanted to hear, was what steps were being taken to meet the situation within a reasonable time. When he came to this, Sir Stafford Cripps, as other Government speakers have done, rather confused the coal and plant issues, both of which affect the electrical industry. He asserted that certain "wasteful and unnecessary" uses of electricity, such as space heating, would have to be prohibited during the summer and said that the Government might be driven to the necessity of a domestic fuel rationing scheme. To cope with the peak-load problem and avoid load-shedding, a wholesale staggering of industrial hours was absolutely necessary.

Meeting Demand for Plant

The placing of these measures in the foreground is no doubt logical, but it is hard to avoid a suspicion that the Government looks on restriction and regulation as the natural lot of the British public. A more positive immediate contribution to the solution of the problem is the encouragement of the use of small (about 50-kW) Diesel-electric sets. As to the complete satisfaction of the need for generating plant, the Government is said to recognize that generating plant is an

obvious "vital priority" and is taking steps to see that it gets a more "complete and unequivocal" preference. Unfortunately this is not the only class of equipment regarded as needing preferential treatment. We have had experience of the struggle for "priority" and it is to be hoped that there will be full realization by the Government that electricity must be provided for industry if the estimates of production for home and export are to be fulfilled. Not only plant but the necessary civil engineering work must be given preference and much of the red tape surrounding the securing of "consents" must be cut away.

High-Voltage Cables

KELVIN'S Law for determining the economical size of a conductor was more easily applied in the conditions prevailing when it was enunciated. The range of load carried at the lower voltages was small and the principle disturbing element was voltage drop. With the increasingly higher voltages of the underground cables that will be necessary in built-up areas, such considerations as dielectric loss and cable power factor may decide the issue. Decisions on technical grounds, however, are small compared with the effect of the prevailing uncertainty regarding the costs of component materials. The value of Mr. R. N. Berry's I.E.E. paper last week lay, therefore, essentially in the model method it presented of how such comparisons should be drawn up.

Street Lighting

AT the public lighting conference last autumn there was evident an appreciable advance in the public attitude towards the illumination of thoroughfares since the Report of the Departmental Committee on Street Lighting was drawn up in 1937. It is now more generally realized that the lower limit of 3,000 lumens per 100 ft (linear) of Class A traffic routes with a maximum width of 40 ft was too meagre an allowance and that the standard should be nearer the upper figure of 8,000 lumens on all important roads. While this can readily be achieved by high-pressure mercury-arc or sodium lamps, there is a strong case, as Mr. J. W. Christopher shows in this issue, for the use of tubular fluorescent lamps in appropriate circumstances.

Fluorescent Tubes

APART from the better lighting and correct colour rendering obtainable with tubular fluorescent lamps installed experimentally in London and described by us earlier, there is also a most important advantage in reduction of glare, owing to the large area of light emission and absence of magnification. This promotes road safety, which is further improved by the visibility of kerbs and buildings. This system of lighting has, however, its economic limits that depend upon the type of thoroughfare. Attempts at securing its benefits less expensively by designing lay-outs with greater spacing or lower luminous outputs of lamps would, we are informed, yield unsatisfactory results.

Vacancies and Nationalization

WE had expected that the matter discussed at Fleetwood last week would have cropped up before—whether a vacancy caused by the retirement of an undertaking's chief engineer should be filled in view of the pending nationalization of the industry. Superficially there appears to be a case for an interregnum with a temporary chief, but against this must be set the facts that the period may possibly be prolonged and that an undertaking's future position may be weakened by the absence of an effective champion. From the individual's own point of view it might perhaps seem hardly worth while moving to a merely temporary position, but then there is the consideration that an improvement in status now should strengthen his position when the industry is taken over.

"Dissipation" of Assets

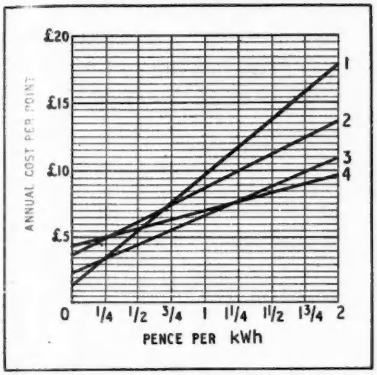
COMPANY electricity undertakings are restained by the Electricity Bill from "dissipating" their assets pending transfer by raising their dividends, repaying capital or making other payments to shareholders. There seems to be no direct prohibition of the reduction of charges to consumers although Section 25 may possibly cover this. On the other hand local authority undertakings are not debarred from contributing to rate relief, within the existing limits, and many of them appear to be doing this. Some are, however, adopting the more justifiable course of reducing charges, somewhat belatedly their consumers may think.

Lighting Urban Centres

Employment of Tubular Fluorescent Lamps

By J. G. Christopher*

THE chief shortcoming of existing street-lighting practice is probably lack of adequate amount of light, the best examples achieving no more than a small fraction of daylight illumination. This is a matter of economics, which was obviously considered by the Ministry of Transport Departmental Committee in framing its final report in August, 1937. The trend of opinion now is that an installation suitable for an important thoroughfare should be designed near or above the upper limit of 3,000 to 8,000 lumens per 100 ft (linear) of road for carriageways not exceeding 40 ft in width, as recommended for Class A traffic routes.

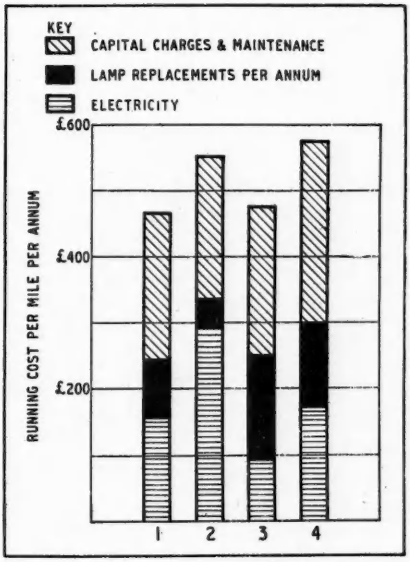


Comparison between costs of different lamps with electricity at different prices per kWh for 4,000 burning hours per annum

(1) 500-W tungsten (5,900 lantern lumens); (2) three 80-W fluorescent (6,800 lantern lumens); (3) 250-W high-pressure mercury-vapour lamp (5,400 lantern lumens); (4) 140-W sodium (5,900 lantern lumens)

Broadly speaking, an infallible recipe for improving any street-lighting installation is to increase the total amount of light for a given length of road, to raise the mounting height and to reduce the spacing. The last two enable a less concentrated light distribution to be employed with a corresponding reduction in glare. Also, glare can be reduced even further and, to a small extent, uniformity of road brightness improved, if the size of the "flashed" area of the optical system of the lantern can be increased, so as to result in a larger area of lower brightness for a given maximum intensity. It must be emphasized that the increased size of "flashed" area must be very considerable in order to attain appreciable benefit, something of the order of 100 : 1 being necessary.

Present practice is therefore a compromise between efficiency and economics. Moreover, the Departmental Committee's recommendations apply in general terms to all traffic routes and, in effect, prescribe a minimum standard which will ensure safety economically for all types. A good case can be made for lighting in excess of the standards laid down in very important thoroughfares, such as those in Central London and the major provincial cities, and many existing installations do exceed prescribed standards.

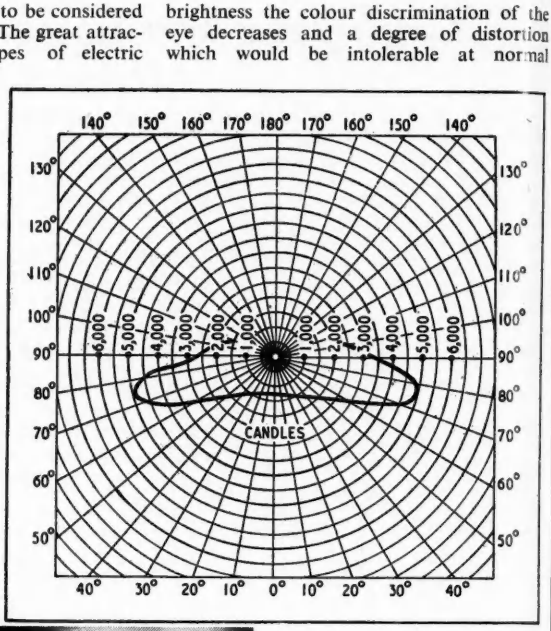


Total costs per mile per annum of the same combinations of lamps and lanterns, based on electricity at 1d. per kWh and 4,000 burning hours per annum

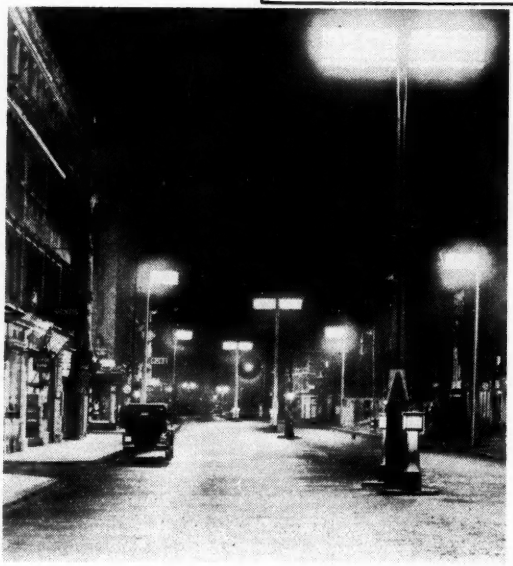
* Exterior Lighting Department, General Electric Co.

Another factor which has to be considered is the colour of the light. The great attraction of the various types of electric discharge lamps now on the market is that their high efficiency as light producers enables a higher standard of illumination to be provided at a very reasonable cost. The light which they give, with the exception of the tubular fluorescent type, differs, however, from natural daylight and from the light of tungsten-filament lamps.

This colour difference is of little importance for normal traffic routes. It does not, in itself, influence visibility, and experience has shown that the public rapidly becomes accustomed to either the blue-green of the mercury lamp or the monochromatic yellow of the sodium. Also, at low levels of brightness the colour discrimination of the eye decreases and a degree of distortion which would be intolerable at normal



Typical polar curve in vertical plane of lantern using seven 80-W fluorescent lamps



View of Brompton Road by night

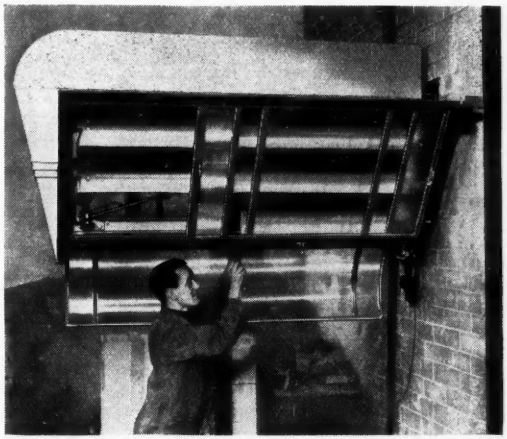
illumination levels may well be acceptable. As brightness levels increase towards those needed for shopping centres, a better colour rendering becomes more desirable, provided that this does not make the cost of an installation prohibitive.

Tubular fluorescent lamps at present available are the 80-W 5-ft type giving an initial light output of about 3,600 lumens and the 40-W 4-ft type giving about 2,000 lumens. Although these lamps are very efficient as light producers used individually, their low wattage involves a system which would usually be uneconomic for normal traffic routes. In order to obtain the required amount of light, either several lamps per lantern must be employed at normal spacings or spacing must be abnormally

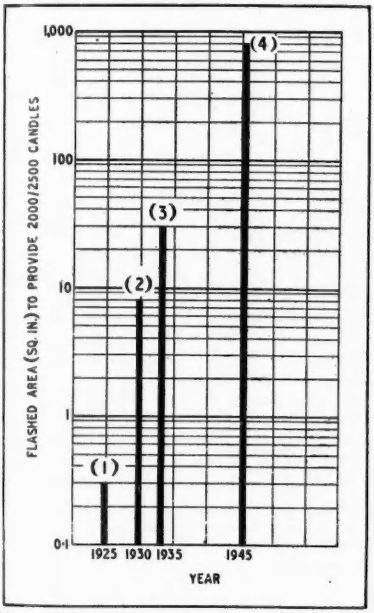
close. The use of several lamps in larger lanterns would increase the capital cost and replacement bill (the cost of, for example, five 80-W tubular fluorescent lamps is considerably more than that of one 400-W high-pressure mercury-vapour lamp) and close spacing results in a larger number of columns or span wires, auxiliaries and mains connections. In the centre of important cities, however, the case for the tubular fluorescent lamp becomes much better; indeed it can be shown to be much more suitable than other types.

The main advantages of fluorescent lamps are as follows:—

Good colour of light of either "daylight" or "warm-white"



Seven-lamp lantern during construction



Increase in flashed area during the past twenty years
(1) 1,500-W bare lamp (wreath filament); (2) 500-W lamp in dome refractor; (3) 250-W h.p. mercury-vapour lamp in bowl or plate-refractor lantern; (4) two 80-W fluorescent lamps in trough reflectors

alternatives; their length, which enables lanterns to be designed with a very large "flashed" area of low brightness, thus reducing discomfort glare and improving appearance; high efficiency so that, although initial capital costs and costs of lamp replacements may be higher, energy consumption is not materially increased and may in fact be reduced. This is an important point at the present time when fuel restrictions make it undesirable to advocate any new system that would consume more coal. A further saving of energy is possible by switching off some lamps in each lantern after midnight, while still conforming to the M.O.T. recommendations. Small wattages of individual lamps enable spacing and mounting heights to be worked out on an "optimum" basis, the number of lamps per lantern then being adjusted to give the appropriate lumen output.

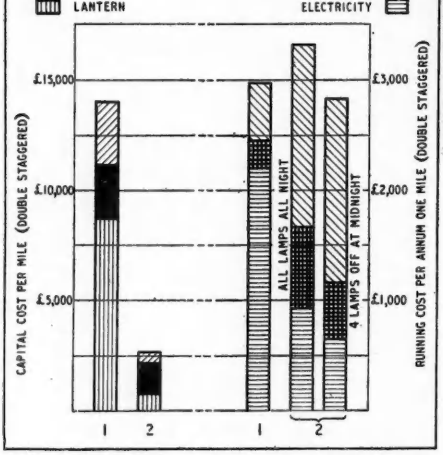
Many kinds of thoroughfare are sufficiently important to warrant this type of installation and each will require different treatment. These include: Very broad administrative or shopping thoroughfares, with two carriageways separated by central islands and with broad congested pavements and tall buildings; narrower business or shopping thoroughfares; traffic centres in which several routes converge on an island. Of the three kinds, the first is probably the most important. The total width, kerb to kerb, is often 50 ft or more and, whether or not there are central islands, such a road must be considered on the basis of two carriageways, each half the total width.

Several rows of light sources will be required and, as the complicated system of poles and overhead wires needed for a span-wire system will almost certainly be out of the question on the grounds of appearance, the use of poles on the kerbs and on islands in the centre of the carriageway must be considered. A normal double-staggered arrangement is the most suitable. The M.O.T. upper limit of 8,000 lumens per 100 ft is scarcely adequate for this purpose and 12,000 lumens per 100 ft of each carriageway is more appropriate.

Spacing should be as close as possible, but will rarely be less than 120 ft between lines of lanterns, on account of the need to avoid obstruction of congested footways and poor appearance. This means that each lantern should give about 14,400 lumens, which is slightly exceeded by seven daylight fluorescent lamps in a 75 per cent efficient lantern.

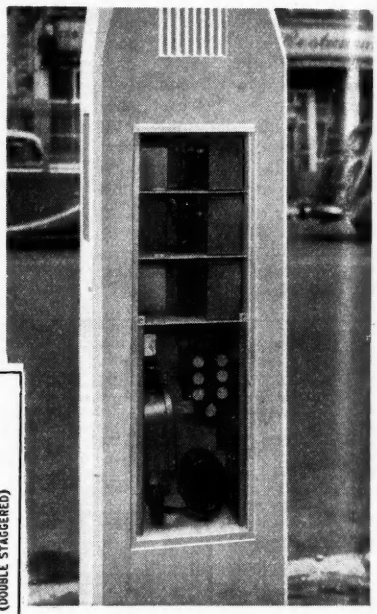
Mounting height on traffic routes is normally 25 ft above the carriageways, but this is insufficient to give a good appearance to the large lanterns necessary. Also an increase in mounting height helps to reduce glare and to give more uniform road brightness, so that a height of 30 ft above the road is desirable. The question of overhang does not arise as the light-emitting areas, 5 ft long, form their own brackets if horizontal.

For the optical design of the lantern, the basic principles are that a relatively short spacing makes high magnification unnecessary



Capital and running costs of comparable tubular fluorescent and filament lighting, based on electricity at 1d. per kWh and 4,000 burning hours per annum

(1) 1,500-W filament lamp in Wembley lantern; (2) Seven 80-W fluorescent-lamp lantern



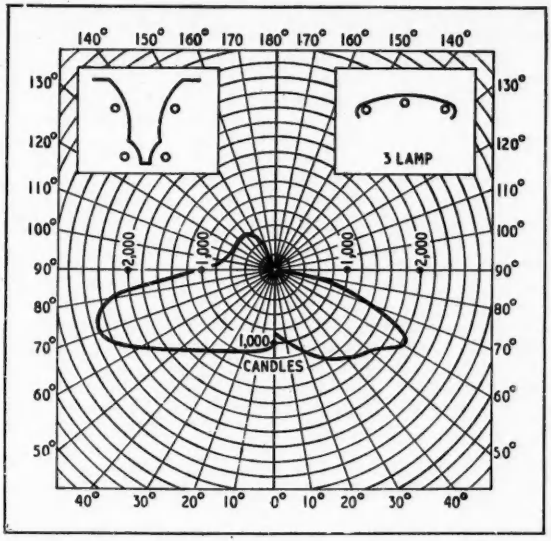
Arrangement of auxiliaries in bases of concrete columns

(thus helping to avoid glare, the absence of which is in itself a most important criterion) and enables the main beams to be depressed to a fairly low angle and the candle power above the maximum intensity to be reduced fairly quickly, which also assists in reducing glare. Traffic congestion may eliminate silhouette vision and a large proportion of the total light must therefore be emitted at low angles for direct vision. The appearance of the roadway must be uniform, and pavements and buildings must receive an adequate amount of light, thus necessitating a very wide light distribution, which is easy to obtain with long horizontal light sources.

At the request of Central London

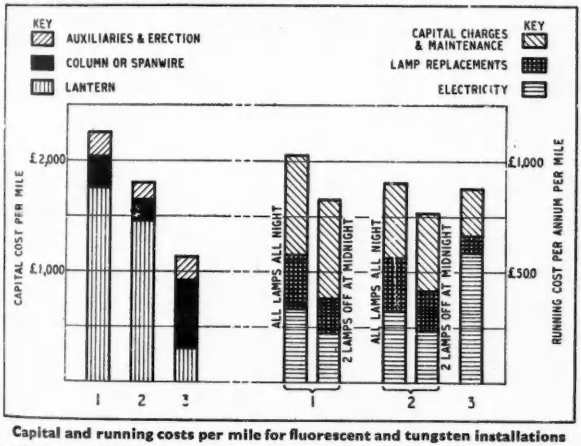
Electricity, Ltd., an installation of ten-lamp lanterns of this design has been erected in Brompton Road, Kensington, as reported in the *Electrical Review* of December 13th.

In order to make an appreciable difference to the apparent glare from an installation, the increase in "flashed" area of the lanterns must be very large and fortunately the dimensions of the 80-W tubular fluorescent lamps inevitably result in a large "flashed" area. That of the 7-lamp lantern is about 1,680 sq in., compared with, say, 60 sq in. for a bowl refractor. This increase does result in a very marked reduction in glare and for this reason the ease of seeing on the Brompton Road installation is even better than the increased quantity of light would lead one to expect. Hopkinson in his paper on discomfort glare in lighted streets, has shown that with a road brightness normal for traffic routes, an increase in "flashed" area of from 10 to 1,000 sq in. will reduce discomfort glare by one "criterion"; that is, from "uncomfortable" to "satisfactory," or from "satisfactory" to "just not perceptible." (I.E.S. Transactions No. 1, January, 1940.)



Polar curve in vertical plane of four- and three-lamp lanterns

The optical system of the lantern consists of a series of anodized aluminium reflectors arranged so that there are three lamps on each side of the lantern and one underneath, each lamp making its contribution to the peak and at appropriate lower angles to ensure a smooth polar curve. The reflectors are enclosed by thick "Perspex" covers to make the whole lantern weatherproof. The side covers slide over each other to give access to the lantern for relamping and cleaning, and the bent portion enclosing the bottom lamp hinges downwards.



Capital and running costs per mile for fluorescent and tungsten installations

(1) Three 80-W fluorescent unit at 80-ft. spacing, spanwire; (2) Four 80-W fluorescent unit at 110-ft. spacing, spanwire; (3) 1,000-W tungsten-filament Wembley lantern at 150-ft. spacing, 25-ft. columns

In order to obtain a suitable type of bracket and adequate accommodation in the base for auxiliaries, special concrete columns giving a mounting height of 30 ft were designed in conjunction with Concrete Utilities, Ltd. The power factor of each complete lantern is made very nearly unity by operating the lamps in pairs, one of each pair being connected in series with a choke and the other in series with a choke and condenser.

Where thoroughfares are too narrow to permit the use of lanterns on columns on central islands and obstructions on the narrow pavements are impassable, the use of span wires between buildings carrying centrally suspended lanterns often provides a satisfactory solution. With span wires closer spacing than with poles can be employed, but it is not usually practicable to mount lanterns at a height of more than 25 ft.

Reflection from Buildings

Owing to the enclosed nature of this kind of thoroughfare, an outstanding type of installation can be provided with about 8,000 lumens per 100 ft (the upper limit of the M.O.T. recommendations), largely because of reflection from buildings, which contribute appreciably to the lighting of the carriageway, partly by direct reflection and partly by creating bright backgrounds.

The required lumen output can be obtained with lanterns using either three 80-W lamps spaced at 80 ft or four such lamps spaced at 110 ft and there will be little to choose between them with regard to lighting. The latter system will be rather cheaper to install and maintain owing to reduced number of span wires and services and lower relative cost of lanterns. Also, the daylight appearance of the road will be rather better with the longer spacing and reduced number of lanterns. Chokes, capacitors and starting switches are usually installed in the lanterns, as otherwise they would have to be housed in special boxes mounted on the walls of buildings.

This form of lighting for narrow roads is economically comparable with an installation of 1,000-W filament lamps mounted at 25 ft and staggered on both sides of the road at a 50-yd spacing. Although the capital costs of the multi-lamp systems are higher, the difference in overall running costs is much smaller and, when some lamps in the multi-lamp lanterns are switched off at midnight, the running costs are actually less. Smaller filament lamps in lanterns on span wires could be used at the same spacing as the fluorescent system but these lanterns are not entirely suitable for an installation of this type. The relatively small "flashed" area of high brightness of, for example, a dome refractor would not be nearly so attractive in the middle of the road, although with certain reservations a cut-off installation might challenge the fluorescent-lamp system. The chief difficulty with a normal cut-off installation is that the proportion of light above the peak is very small and a hard cut-off line is frequently produced on the buildings. This tends to produce a "tunnel" effect and for this reason a little light should always be retained up to and above the horizontal.

The third kind of suitable location for fluorescent tubular lamps is important traffic junctions of the Piccadilly Circus type. These may form an enclosed area with a peripheral carriageway in which normal street lighting layouts can be adopted using 3-, 4- or 7-lamp lanterns. On the other hand, they may demand entirely specialized treatment on the basis of area lighting, when the normal axial or non-axial asymmetric light distribution will not be appropriate. In such cases lanterns with a symmetric light distribution may be required, but variations from the normal type of light distribution can be more easily produced with tubular fluorescent lamps than with other types. Any desired wattage can be obtained by increasing or decreasing the number of lamps per lantern arranged horizontally, vertically or at an angle to suit the light distribution required. Each case must be treated on its merits. The daylight appearance of the complete installation will usually be against very close spacing on account of the multiplicity of poles and lanterns.

Acknowledgment is made to Central London Electricity, Ltd., for encouragement and assistance in connection with the Brompton Road installation, which was a direct outcome of its belief in the possibilities of this form of lighting.

Street Lighting at Gateshead

The Gateshead Town Council has approved a report by a committee for electric street lighting at a cost of £89,579 or £103,784 if concrete pillars are used instead of steel poles. A sub-committee has been appointed to examine the scheme and submit recommendations for putting it into operation.

Rival Heating Methods

Electricity as Economical in Coal as Gas

INDEPENDENT statements and recent reports have suggested that electric heating involves the consumption of from 60 to over 100 per cent more coal than heating by gas. How erroneous implications of this sort are is demonstrated by MR. P. SCHILLER (E.R.A.) in a paper presented to the Institution of Electrical Engineers. The author explains how the promiscuous use of percentage efficiencies can be misleading. He proceeds to indicate that a reliable method of comparison consists in estimating the quantities of solid fuel, gas and electricity required to provide a given schedule of domestic heating by various combinations of means and then calculating the comparative total amounts of raw coal needed.

The method proves that, with electricity and gas produced and utilized in the present manner, there is not any decided difference between them for domestic heating purposes in respect of economy of coal. Therefore the author contends that henceforth this factor should be eliminated from adjudications between the two rival commodities. Actual development has demonstrated that gas does not offer any advantage of cost to the consumer. With the introduction of high-power boiling plates and simmer control, there remains no amenity in which gas appliances may claim superiority of service. The greater cleanliness of the electrical method is unchallenged.

By-products need to be considered by the economist; coal could be carbonized in electric power stations without the necessity of distributing gas. Pending large-scale trials, the advocacy of wholesale transition to smokeless fuels appears to be precipitous. The beneficial effect of competition is undisputed, but would not in itself justify the perpetuation of duplication. Well organized research could bring about further improvement of domestic appliances without the stimulus of competition.

Discussion

The first speaker in the discussion was SIR JOHN KENNEDY (Electricity Commission), who said that the coal available was very variable in nature and that less than half of it was suitable for the gas industry. In the past the electricity supply industry benefited by finding ways of utilizing poor quality small coal which had been purchased at a very low price; that had now gone by the board. Whether the National Coal Board would be able to differentiate in price between one quality and another and sell coal on a calorific value basis was a matter which he could not discuss.

It would be deplorable if people were required to use fuels which did not provide the service required. In the pottery industry, for example, it might be thought that electric firing was a very extravagant use of coal, but the manufacturer found that in that way he could obtain a better product with less wastage, so that for a given expenditure he obtained a greater return than was possible by any other means. Similarly an electric bowl fire used for twenty minutes to provide warmth while dressing, was a very efficient way of obtaining the service required and it would be absurd for a coal fire to be used for that purpose. Gas retorts had been heated electrically; because of the absence of heat losses in an electric retort and the complete control of temperature possible it was conceivable that such a process might ultimately be found to be desirable.

"Different Fuels"

MR. A. H. BARKER (consultant) said that the gas and electrical industries were widely different and used what might almost be regarded as different fuels. One made and sold one product only, non-material energy; the other produced at least three material products, gas, coke and tar.

The main short-term national interest was to reduce the consumption of coal. The long-term interest was to secure that every pound of coal produced, however used, contributed most efficiently to the national wealth, comfort or convenience, and, subject to these overriding considerations, that as many pounds of coal should be used as possible.

Both gas and electricity were necessary in any civilized community. It would be necessary to distil coal even if no heat were required from the gas, and to produce electric power even though the thermal efficiency were low. It was astonishing that no better method of producing electrical energy from coal had been developed. The gas industry, on the score of cost, had almost a monopoly in the production of cheap, mobile heat, but the quality of the heat it produced was very much inferior to electric heat. Where the extra quality was worth the additional cost, electricity should be used in the national interest.

MR. A. G. CONNELL (Halifax Electricity Department) pointed out that in future electricity undertakings might demand their pick of suitable fuel and a number might install carbonizing plants, burn the gases under the

boilers to produce electrical energy and sell the by-products. In that case the gas distribution network might become unnecessary.

MR. F. M. BIRKS (Gas Light & Coke Co.) said that when new plant now in course of building was completed his company felt confident that the so-called efficiency of gas production could be raised to 60 per cent, or more. Incomprehensible tariffs had been used by the electrical industry to enable it to enter the fields of cooking and heating, whereby at least two tons of coal were used instead of one if gas were employed.

MR. E. B. POWELL (London Power Co.) recalled that in 1942 he had to investigate whether fuel was wasted when electricity was used domestically instead of gas. He came to the conclusion that for cooking there was very little in it. For water-heating gas had definite advantages, but he did not accept the figure given in the Egerton report, which suggested that 23·5 kWh was required to do the same work as one therm of gas. He thought that 18 kWh would be nearer the mark.

Power Station Efficiency

The Commissioners' returns for 1947 showed that 43 per cent of the power used in this country was supplied to the consumers at 22·4 per cent efficiency. There was no power station being built which would not deliver at 24 per cent and when the present difficulties due to shortage of fuel and plant were overcome, half the output would be supplied to the consumer at that figure. But he did not think that more than half of the gas going out would have a carbonizing efficiency of 79 per cent.

It would be unreasonable to try to force a consumer to take a certain fuel, but an effort should be made to persuade him to use electric topping-up heat, electricity for cooking and gas for water-heating.

DR. OSCAR FABER (consultant) said he did not regard electricity and gas as the author did, as "rival commodities." It was in the national interest that gasworks should use all the coal which was particularly suitable for gas and that electricity works should use all the coal which was not suitable for gas. To juggle with the losses in a gasworks, putting all the losses on to gas when it suited the argument, was not a profitable proceeding.

MR. FORBES JACKSON (L.C.C.) said that the inference behind all propaganda was that coal saving was of overriding importance, but it would be reasonable to argue that with several hundred years' supply of coal under our feet, coal conservation for its own sake was not a worth-while aim and remote posterity might be left to look after itself in that respect. He stated that the labour involved to the housewife in burning a ton of coal in the home was five times greater than the labour involved in mining it.

MR. SCHILLER briefly replied to the discussion.

Flameproof Enclosures

PROGRESS made with the "proving" of flameproof enclosures for electrical apparatus is recorded in the annual report for 1946 on the work of the testing station at Buxton of the Ministry of Fuel and Power.

The general trend is indicated by the increases of new applications by 23 to 110, of enclosures tested by 36 to 124, of over-pressure tests to prove margin of strength by 11 to 32 and of original approvals by 3 to 127, while supplementary approvals declined by 66 to 198. Seven enclosures failed to pass the tests applied to them; six of them, after modification, passed repeat tests.

During the testing of busbar chambers it became evident that abnormal explosion pressure could develop. The information so obtained is a useful addition to the data being collected to form the basis of experiments for correlating critical dimensions of long and shallow enclosures utilized as connection chambers for combinations of switchgear units.

Information based on experiments with a drilled plug intended to function as a breathing device when fitted to motor enclosures has been supplied to the manufacturer concerned.

Reports have been issued on the examination of a housing for "Sashalite" photoflash bulbs as a modified form of certified lamp enclosure; also upon lighting equipment for underground cinematography, consisting of a combination of certified flameproof lamp housing with switches, plug and socket connectors and interconnecting cables.

Revised editions of Testing Memorandum No. 4 and of BS. 229 were issued last year, the cope of both documents having been extended.

Lighting in Mines

LIGHTING in coal mines is the subject of a paper presented by MR. J. IVON GRAHAM to the Illuminating Engineering Society in London. The author points out that the Reid Committee recommended a standard of illumination of the order of 0·4 ft-candle in general working areas, though it appreciated that that amount of light could not be achieved with hand or cap lamps. He next explains the advantages and inconveniences of transportable self-contained battery lamps, followed by descriptions of tests of a number of mains lighting installations which are on trial.

The characteristics of various sources of light are mentioned, including fluorescent lamps, the application of which is now being developed by the Ministry of Fuel and Power. Finally the pneumatic-electric lamp and cost of its operation are described in some detail, as well as the use of vapour-discharge and fluorescent tubes in substitution for filament bulbs in this combination generator-lamp.

Views on the News

Reflections on Current Topics

ATTENTION was drawn in the Commons last week to the plight of some miners in South Wales who relied entirely upon electricity for cooking and water-heating in their prefabricated bungalows. I pass over the irony of the situation to record that Mr. Shinwell, replied that the question of electricity restrictions was being reconsidered. The penalization of electricity consumers is wrong and it has gone on long enough. If the idea were to diminish the peak demand there would be some sense in the restrictions, but in fact consumers may use their appliances at the peak hours and there has been load-shedding as a result. Coal economy is the official reason given for imposing these annoying and illogical prohibitions, and once more I ask why electricity consumers only should be expected to save coal.

* * *

Ever since the "crisis" began rumours have appeared in the daily papers of impending schemes for rationing gas and electricity. I recall that at the beginning of the war an elaborate plan, complete with "equivalents," was devised and electricity supply undertakings had to print millions of forms for the purpose. The *Electrical Review* (among others) showed how impossible it was to ration intangible services and eventually the scheme was dropped. But the idea persisted, for in 1942, Lord (then Sir William) Beveridge was commissioned to draw up a rationing scheme and he produced an admirable one, on a "points" basis. Although admirable the arrangement was really no more practicable than the earlier one and it went into the same pigeon hole.

* * *

The fact is that only by actually cutting off (impossible in the case of gas) can these services be rationed. There can be no effective check on a freely available supply until the damage has been done. Then there is a choice between admonition, deprivation or prosecution of those who have exceeded their allowances and it would be a bold Government, in a democracy, which would be prepared to face the consequences of the last two expedients. Appeals to reason and public spirit will have to be relied on. Consumers must be treated as intelligent adults and not subjected to further rationing complications.

* * *

I see that Mr. V. W. Dale, of E.D.A., has replied to the contentions of Mr. M. Milne-Watson in *The Times* to which I referred last week. In addition to pointing out (as I did) the considerable difference between the types of coal used by power stations and gasworks, Mr. Dale attacks Mr. Milne-Watson's "equivalent" of 20 kWh to one therm. He mentions that a Ministry of Fuel publication gives an equivalent, in connection with cookers, of 12½ kWh to a therm, while many engineers, he says, claim that 10 kWh correspond to a therm for heating and cooking in general. To which I may add that the 1939 rationing Order made 1,400 kWh equal to 100 therms (or one ton of coal) and the Beveridge plan equated 1 cwt of coal, 5 therms of gas and 90 kWh of electricity (subject to further examination). I rather doubt the wisdom, though, of beating down the figure in case the Government is rash enough to introduce rationing on a thermal comparison basis.

* * *

In view of the speculations about the future of the British Electrical Development Association, it is interesting to know that E.D.A.'s French counterpart is still functioning although nationalization has been carried out in France. This body, la Société pour le Developpement des Applications de l'Electricité (A.P.E.L.), was originally the publicity organization of the Paris electricity distribution company; now it is acting in a similar capacity to Electricité de France, the State-controlled national supply authority.

* * *

Because of its two tides a day Southampton is an important factor in our overseas trade. It is very unlikely, therefore, that the town and port authorities will greet with any enthusiasm a proposal by the Isle of Wight County Council that the possibilities of damming the Solent for generating electric power should be inquired into. I doubt whether the results would form adequate compensation for the damage done to our export business. —**REFLECTOR.**

Transmission Cables

Economics of Higher Voltage Types

IMPENDING extensions of the grid system are expected to involve the use of underground cables to a much greater extent than hitherto. To assist cable makers to direct their technical development along the most beneficial lines and so enable them to anticipate demands for cable of the higher voltage types, Mr. R. N. BERRY (C.E.B.) has reviewed the economics of the subject in a paper prepared for the Transmission Section of the Institution of Electrical Engineers.

The author shows that at the higher voltages the costs of the dielectric loss and of reactive compensation are more important than those of the I^2R loss. Those fixed costs as well as the charging current and impulse strength are dependent upon the designed maximum stress on the dielectric and the author indicates why the value of that stress must not be increased without considering all its effects.

Analysis of the total cost of cable installation enables the author to derive economic voltages for various loads and to show how the cost of energy delivered is increased on account of the cost of cable transmission. The advantage of employing the higher voltages is mainly due to the spreading of the installation expense over a bigger load. The installation costs, including excavation and reinstatement, are very variable and can be the largest item in the total cost of a service, overriding all other economic considerations.

It is appreciated that choice of voltage and cable size is not governed solely by cable considerations, since the cost of terminal equipment, short-circuit duty and voltage drop are sometimes the determining factors, but the latter aspects are outside the scope of the paper.

Future Supply Tariffs

Likelihood of Deficit on Present Basis

ADDRESSING the Association of Supervising Electrical Engineers on March 17th, Mr. G. O. MCLEAN gave a brief historical survey of the electricity supply industry leading up to a discussion of the present-day basis of tariffs. He then drew attention to certain factors which affected the prices at which electricity could be sold in the future.

Next year, he said, total capital expenditure for the industry would probably exceed £900 million and the Government would have to find interest on £550 million. Sales could be expected to amount to not less than 40,000 million kWh. Working expenditure, because of increased coal costs and reduced load factor, would be at least 0·7d. per kWh, excluding capital charges, or in total £117 million. Revenue, at existing tariffs, would be 1·05d. per kWh or in total £175 million. Out of the difference between the two of £58 million, the nationalized industry would have to find interest on the £550 million at 2½ per cent, depreciation on the whole of the capital at 4 per cent, and taxes, as at present, amounting to £6 million, leaving a bare £2 million for other overheads, such as voltage standardization. If existing tariffs were not to be increased, this £6 million would have to be paid by the public in some other form.

By 1953 capital expenditure would probably have increased to £1,750 million and sales to at least 52,800 million kWh, allowing only 5 per cent increase each year (if unrestricted, the sales would be much more). The working expenditure would then reach £150 million, allowing for a reduction in the average price to 0·68d. per kWh sold. If tariffs were not altered, revenue would amount to £242 million, giving a gross surplus of £92 million, but interest and depreciation alone would require £104 million. Even if no taxes were levied on the industry, the deficit would be £12 million. Thus an increase in tariffs or a drastic reduction in expenditure would be necessary before 1953.

Ships' Electrical Equipment

Advantages and Disadvantages of A.C.

THE electrical equipment of modern cargo and passenger ships is the subject of a paper prepared by MR. C. P. HARRISON (G.E.C.) for the March meeting of the Association of Supervising Electrical Engineers.

The author first mentions some of the special shipboard conditions that have to be observed, in cases causing electrical design and construction to differ from normal commercial and household requirements. After indicating typical examples of features embodied to satisfy those requirements, the paper proceeds to describe some of the more interesting machinery and accessories.

The author concludes with brief comments on the use of a.c. in ships. Its advantages are enumerated as cheaper generators and motors, simpler and more robust motors, simpler starters, ease of transmission and transformation to any voltage; it permits the use of standard accessories, silent switches and fluorescent lighting, reduces radio interference; it makes it easy to take in shore supplies and lowers maintenance costs.

The disadvantages of a.c. are said to be its unsuitability for cargo winches, motor speed variation less easy, alternators less easy to regulate, parallel and synchronize and the difficulty of handling peak currents when starting squirrel cage motors.

For the present it seems that d.c. is necessary for some purposes, especially deck machinery, so a mixed a.c./d.c. installation might be advantageous, depending upon the size of ship and proportion of machinery that must operate at variable speed.

CORRESPONDENCE

Letters should bear the writers' names and addresses, not necessarily for publication. Responsibility cannot be accepted for correspondents' opinions.

Power for Essential Production

WE were interested in the paragraph in "Views on the News" in your issue of March 7th in which it is stated that a Scottish concern producing coal cutters was recently shut down for an hour by a power cut.

Immediately on the introduction of the general power cut in this district we pointed out to the Ministry of Fuel and Power that we had in course of manufacture a large number of cables for collieries, including coal-cutter trailing cables, and suggested that it would be in the public interest to provide us with sufficient power to carry on with the manufacture of these cables. Notwithstanding considerable insistence on our part we received nothing but a refusal to consider this suggestion.

JOHNSON & PHILLIPS, LTD.
*Charlton, S.E.*7. W. GLASS,
Director and General Manager.

Institutions and the "Closed Shop"

IN the *Electrical Review* of March 7th mention is made of a proposal that every employee of the Hammersmith Borough Council shall be a member of "his appropriate trade union *or* professional association." The Institutions of Electrical, Mechanical and Civil Engineers are specifically mentioned as coming within the latter category.

In view of the attitude of these Institutions that it would be *ultra vires* for them to operate a members' employment section (if supported by Institution funds), it will be interesting to see whether they will take disciplinary action against any of their members who definitely make use of their membership, and therefore contribute directly to the Institutions' funds, for the purpose of obtaining or retaining employment under the Hammersmith Council and, by such action, bring the Institutions into the category of trade unions assisting to implement a political movement, namely, that of the so-called "closed shop." Or will the three Institutions insist that such members shall also join a recognized or "appropriate" trade union and thus relieve the Institutions of the onus—or stigma—now to be thrown upon them?

C†

The use of Institution membership as a technical or professional qualification is a recognized and quite justifiable procedure. That this is in no way the case with the Hammersmith movement is proved clearly by the fact that membership of "his appropriate trade union" is to be an accepted, and probably preferred, alternative. This is further confirmed by the fact that present employees who will now, for the first time, have to join a union or an institution have presumably already satisfied their employers as to their technical qualifications. In these circumstances membership is obviously demanded so that the Institutions can be regarded as "bargaining agents" in questions of rates of pay, working rules and the like. Although in some countries institutions do interest themselves in such matters, it is probable that in England such action would, at any rate in the case of the three leading engineering bodies, lead to internal disruption which might well prove disastrous.

One further question may be asked. In cases where municipal authorities adopt similar "closed shop" rules there will probably be many employees, as already mentioned, who are qualified for membership of one of the Institutions, but who have never joined. Will the Institutions now accept them knowing, as their sponsors also should know, that their reason for wishing to become members is merely to enable them to retain their jobs under the new regulations?

A.M.I.E.E.

College Curriculum

THE astounding increase in the number of students in attendance at colleges and universities may be attributed to the attractive Government-sponsored training schemes, professional institutions and enterprising employers. These recently inaugurated educational developments should be accompanied by a modernistic approach to electrical engineering.

In the past it has become almost traditional to demand from the student a fairly comprehensive incursion into d.c. theory, before the introduction of a.c. work. Doubtless the textbooks have accumulated material in chronological order, resulting in the more recently developed field of a.c. taking a later

stage of the syllabus. The theory of the d.c. winding, however, cannot be assimilated without the fundamentals of a.c.

Logically it is reasonable to assume that the order of subject matter should be electromagnetic induction, the transformer, the induction motor, alternators, and finally d.c. machines, at which stage only commutation would be necessary. The composite picture presented in this way would provide the student with a clearer and more interesting syllabus.

The implication which arises from the designation of d.c. machines is false; in a true theoretical sense they are basically a.c. machines. To-day it is essential that text-books and the college curriculum should be chosen to suit educational requirements if the need for a greater number of technicians in industry is to be satisfied.

Bury, Lancs. H. SPARKE, Mem.A.I.E.E.

Safety in Factories

REFERRING to the report on Mr. W. Fordham Cooper's I.E.E. paper in your issue of November 22nd, the author rightly emphasizes the need to prevent inadvertent starting of remote controlled machines. This is an ever-present danger with mill tables in steel works, such as the Tata Iron & Steel Co. where I am engaged, in which highly humid and hot conditions prevail. Multi-core control cables or control wires in steel conduits frequently get earthed or internally short-circuited, which causes the control panel to be suddenly energized, unless care is taken to open the main power switch, resulting possibly in serious accidents to mill operators.

In a widely-spread interconnected d.c. network, as normally found in large steel works, it is practically impossible to prevent or locate immediately earths that occur on crane power rails. One or the other line remains earthed at a fixing bolt and can cause inadvertent operation of magnetic control panels. No manufacturer, so far as I am aware, has provided automatic means of preventing operation of a panel under those conditions.

"Failure of Safety" as defined by Mr. Cooper should be a fundamental feature of every electrical control for dangerous machines. As a result of experience I have devised a circuit which gives complete protection against inadvertent operation. This embodies relays which supervise the operation of the control as long as the controller is in the "off" position. If fault conditions occur which suddenly tend to energize the panel, the earth-fault relays at once operate to prevent the directional contactors going in. The whole control remains inoperative so long as the fault in the particular control region persists.

The need for standardization of crane controls was mentioned in the discussion of the paper referred to. At present no controllers of different makes of which I have knowledge are the same and users of many overhead cranes are forced to standardize the products of one manufacturer or another, who thus tends to become a virtual monopolist.

Apart from standardization, dynamic-braking lowering-hoist magnetic controllers, all designed practically on the same principles, are without automatic protection under certain fault conditions during lowering of overhauling loads. A dangerous situation is created by the failure of the dynamic-braking lowering circuit, possibly because of open circuit in the motor-armature braking loop or operation of the series over-hoist limit switch due to the snapping of the steel-wire rope supporting its counterweight. I have designed a modified control which incorporates automatic protection against such contingencies, and will be pleased to send particulars of this or of the circuit earlier mentioned to anyone interested.

Jamshedpur, India. K. S. KUKA.

N.A.L.G.O. and Electricity

IT has occurred to me after reading "Company Engineer" (*Electrical Review*, March 7th) that the engineers now desiring the protection of N.A.L.G.O. are those who, although not attracted by the prospects of the E.P.E.A., were quite ready to accept the E.P.E.A. Schedule of Salaries, but were not prepared to become members.

It is now laid down that technical members of N.A.L.G.O. who are in the electricity supply industry shall become members of the E.P.E.A.

Sunderland. F. B. HUMPHRISS.

King's College Engineering Society

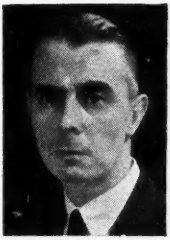
In connection with the centenary of King's College (London) Engineering Society which we mentioned recently, a history is being produced and copies can be reserved by those who desire them upon application to Engineering Society Centenary History, King's College, Strand, London, W.C.2.

PERSONAL and SOCIAL

News of Men and Women of the Industry

AFTER more than twenty-five years with the British Electrical and Allied Industries Research Association, **Mr. H. C. Silver,** M.I.E.E., is retiring on March 31st from his position as the senior technical secretary responsible for research sections dealing with cables, overhead lines, safety problems and insulating materials. Born in 1881, he was educated at Brighton College and University College, London, and in 1901 proceeded to Faraday House Electrical Engineering College as assistant in the Testing and Standardizing Department, later being appointed superintendent. In 1918, he joined the technical staff of the British Standards Institution, and in 1920 was appointed as committee secretary in the newly-formed Electrical Research Association.

Mr. H. C. Silver



Mr. E. E. Hutchings

Mr. Silver is well-known to many in the electrical industry through his handling of the large number of technical committees with which he has been associated—in particular those responsible for the classic work leading to the standardization of cable ratings, and those under whose authority the various British Standards on electrical insulating materials have been issued. Mr. Silver will continue with the Association, on special work, until September 30th.

Mr. E. E. Hutchings, B.Sc. (Eng.), A.M.I.E.E., has been appointed a senior technical secretary and will take over from Mr. Silver the responsibility for the sections dealing with cables, overhead lines and safety problems. Mr. Hutchings received his technical education at the Northampton Engineering College, London. He joined the staff of the E.R.A. in 1925 and worked for a period in the Switch and Control Gear Section, transferring in 1930 to the researches on cable rating and allied problems. In recent years he has been responsible for the major part of the experimental work on the latter subjects. Mr. Hutchings is the author or co-author of a substantial number of E.R.A. reports and he is E.R.A. representative on a number of I.E.E. Committees.

Subject to confirmation by the Gravesend Corporation, **Mr. D. G. Gahan,** A.M.I.E.E., late assistant power station superintendent at Calcutta, has been appointed generation superintendent in the Electricity Department, and **Mr. W. H. Hughes,** A.M.I.E.E., at present assistant divisional control engineer with the North-Eastern Electric Supply Co., has been appointed distribution superintendent.

Mr. A. W. Allwood, deputy city electrical engineer of Norwich, has obtained the degree of M.Sc. (Engineering) of Bristol University.

Mr. F. Burston, A.M.I.E.E., mains superintendent with the Greenock Corporation, has been appointed chief assistant electrical engineer with the Stockton-on-Tees Corporation Electricity Department.

Mr. L. J. Simmons, A.M.I.E.E., A.M.I.I.A., has left Brighton Corporation electricity undertaking to take up the appointment of mains superintendent in the Willesden Corporation Electricity Department.

Messrs. J. Flood, Assoc.I.E.E., **E. Jacobi,** M.I.E.E., **W. F. Parker,** A.M.I.E.E., and **L. A. Parsons,** Assoc. I.E.E., have been appointed technical directors of Troughton & Young, Ltd.

Mr. S. Smith has been appointed managing director of the Wellman Smith Owen Engineering Corporation, Ltd., to succeed the late Mr. J. Foster-Smith. **Mr. C. J. Barker** has been appointed to the board.

Mr. A. M. Anderson, M.I.E.E., formerly of the Witton Engineering Works of the General Electric Co., Ltd., and for the last five years general manager of the company's Leicester factory, has been appointed personal assistant to Sir Harry Railing, chairman of the company.

Mr. A. M. Anderson

Mr. J. Billcliff, who has been appointed deputy borough electrical engineer and manager at Nuneaton, is at present technical assistant at Cheltenham. He received his education at Morecambe Grammar School and was articled to Mr. J. F. Simpson at Preston, with which electricity undertaking he became junior mains assistant in 1931 and mains assistant in 1935. In 1938 he joined the Eastbourne Electricity Department as assistant mains engineer, being promoted to senior mains engineer in 1941, a position which he held until 1944, when he went to Cheltenham

as technical assistant and deputy mains superintendent. He was promoted to technical assistant at Cheltenham in February last. Mr. Billcliff is an associate member of the Institution of Electrical Engineers and hon. secretary of the Cheltenham Association of Engineers.

Mr. W. P. Lilwall, chief electrical engineer and manager at Fleetwood, whose retirement on May 31st is announced, has been at Fleetwood since 1919. After education at Manchester Technical School and the British Westinghouse Co., Mr. Lilwall became a pupil in the Stretford Electricity Department, later serving with the Warwick & Leamington Traction & Power Co., the Scottish Central Power Co. and Kettering Electricity Department. He was president of the I.M.E.A. in 1944-45.

Mr. W. P. Lilwall

Mr. D. Lacy-Hulbert has been made director of production in the Precision Tubes Division of Tube Investments, Ltd., and **Mr. E. D. E. Andrewes** has been appointed as a director and general manager of the group's export organization.

Mr. James Stewart, B.Sc., A.M.Inst.C.E., has been appointed area construction engineer for the South-West England Area of the C.E.B.

Lord Burghley and **Sir Campbell Stewart** have been appointed directors of A. C. Cossor, Ltd. Messrs. A. H. Johnston, J. W. Horton and J. H. Williams have resigned from the board.

Mr. G. A. T. Burdett has been appointed Press officer in the Sales Promotion Department of the Plessey Company, Ltd. Mr. Burdett was formerly on the editorial staff of *Electrical and Radio Trading*, and before joining the R.A.F. at the outbreak of war was sales engineer with Central London Electricity, Ltd., and previous to that was with the North Wales Power Co.

At the meeting of the West Midlands Joint Electricity Authority held on March 14th, **Mr. C. Heathcock,** F.C.I.S., and **Alderman W. S. Lewis,** J.P., were respectively appointed chairman and vice-chairman. Mr. Heathcock is managing director of the Midland Electric Corporation for Power Distribution, Ltd. Alderman Lewis is the representative on the Authority of the workers in the supply industry. He was Lord Mayor of Birmingham in 1942-43 and is the area secretary of the Electrical Trades Union.

The Davenset Choral and Dramatic Society of Partridge, Wilson & Co., Ltd., recently produced at the St. Philips Hall, Leicester, an original musical fantasy entitled "Moonshine and the Magic Ring." The show was given on three nights and in spite of arctic weather the hall was filled each night. The whole of the show, including dialogue, libretto, lyrics, music, costumes and stage lighting, was devised and produced by members of the Davenset Electrical Works. A special stage lighting switchboard was designed using "Variac" transformers to provide dimming colour and light mixing controls. This switchboard will be used later in the new theatre which is at present being built at Davenset works as part of the new canteen premises.

About seventy old and present "Ferrantians" met at the Savoy Hotel, London, for their fourth reunion dinner on March 11th. The guest of honour was **Mr. V. Z. de Ferranti.** The last reunion was held in 1924, when the late Dr. S. Z. de Ferranti, F.R.S., was the principal guest. On the present occasion, **Mr. Arthur E. Hadley,** C.B.E., presided, and the principal toast was ably proposed by Mr. Allen West, who, with Mr. Hadley, was with the firm at Charterhouse Square in the late 'nineties. Mr. de Ferranti was in happy and reminiscent vein in his reply and other speakers included Mr. T. F. Lister, Mr. D. Z. de Ferranti and Sir Robert Watson-Watt. Mr. W. E. Crawley proposed "The Chairman" and Mr. Hadley replied. A silent toast was given in memory of departed Ferrantians.

Arising out of the function it was agreed to form the Ferrantians' Association with Mr. V. Z. de Ferranti as first president and Mr. R. J. Hebbert (Ferranti, Ltd., Hollinwood, Lancashire) and Mr. W. E. Warrilow (24, Bath Hill Court, Bournemouth) as joint hon. secretaries, with either of whom interested Ferrantians (particularly those overseas) are invited to communicate, and they will be pleased to send copies of the souvenir distributed at the dinner to any Ferrantians who were unable to attend.

On March 4th **Mr. W. E. Lawton,** managing director of the Industrial Electrical Co., Ltd., entertained the employees to a dinner and dance at Beale's Restaurant, Islington. During the evening Mr. Lawton and Mr. A. G. Relf, director and secretary, both paid tribute to the work of the staff during the war and in the present difficult times. About 100 guests attended.

An enjoyable evening was spent recently at the Grand Hotel, Hanley, Stoke-on-Trent, by members of the electrical and allied industries at a dance and whist drive given by John Godden (Stoke), Ltd., electrical engineers and wholesalers. About 200 attended, including the Deputy Mayor and Mayoress, Alderman and Mrs. Williams, together with representatives of many of the local industries and manufacturers. Mrs. F. E. Woodward, who has completed over twenty-one years with the company, was presented by the staff with a bouquet and silver cake basket and **Mr. J. Godden** presented her with a silver dressing table set.

The annual dinner and dance of the Sussex Centre of the Electrical Industries Benevolent Association was held on March 7th at the "King Alfred," Hove. The function was a great success in spite of the weather and approximately 400 were present. **Mr. Allen West** presided and the principal guest was Mr. W. Riggs, president of the Association. Among others present were Messrs. N. Boydell, T. W. Dann, H. Dixon, H. Pryce-Jones, E. H. Skinner and F. Swarbrick, engineers and managers of electricity undertakings in the area, and Mr. H. Senior Fothergill, secretary of the Association. The function was well supported by manufacturers and electrical contractors. As usual there was a long list of prizes presented by various manufacturers.

Obituary

Mr. W. Fennell.—The industry loses a well-known figure by the death on March 13th of Mr. William Fennell at the age of seventy. Mr. Fennell received his technical education at Finsbury Technical College and later acted as senior student and assistant to Professor John Perry, who was then developing his d.c. meter. After holding junior positions at Galway and with the Brompton & Kensington Co., and serving a term with consulting engineers he was appointed borough electrical engineer of Wednesbury. Later he went to the British Insulated Cables as a resident engineer, contracts department, before joining the North Metropolitan Co.

The late Mr. W. Fennell

In 1918 he became general manager and engineer of the Northwich (later the Mid-Cheshire) Electricity Supply Co., a position which he held until his retirement in 1944. He remained a director of the company and of the Mersey Power Co. Mr. Fennell gained a reputation for his work in rural areas; he was a pioneer of the rural h.v. branch line without conductor earthed at its source, saving h.v. insulation, switching and fusing in one conductor of the system. He also adopted the use of "compound" lines carrying both h.v. and l.v. circuits. He was a founder and past-president of the Overhead Lines Association, the nucleus of the I.E.E. Transmission Section, of which he was chairman in 1936. He had also served as chairman (1938-39) of the North-Western Centre of the I.E.E. Mr. Fennell was also an active member of the British Electrical Development Association and the Provincial Electric Supply Association and was well known as a writer on electricity supply matters, including a book on "The Grid and its Operation."

Mr. A. M. Mulliner.—We regret to record the death of Mr. Arthur Montague Mulliner, A.M.I.E.E., former borough electrical engineer of Middleton (Lancs), which occurred on March 9th at the age of sixty-six years. Mr. Mulliner retired on account of ill-health in 1945 after twenty-one years at Middleton.

Mr. W. R. Holland.—We learn with regret that Mr. William R. Holland, of the A.C. Engineering Department, B.T.H. Co., Rugby, died on March 10th, after a long illness. Mr. Holland was educated at Merchant Venturers' School, Bristol, and the University of Bristol, where he graduated B.Sc. with first class honours. He entered the Test Department of the B.T.H. Co. in 1916, but later joined the Royal Engineers (Signals) and was on active service in East Africa from 1917 until the end of the war. He returned to the B.T.H. Co. and in 1920 joined the staff of the A.C. Engineering Department, becoming head of the section dealing with the design of all types of synchronous machines in 1922. He introduced new and more exact methods of design which enabled machines to be constructed and dispatched without the modifications of pole shims, etc., after preliminary testing. He was also able to give more certain guarantees of efficiency and was responsible for considerable reductions in machine sizes in relation to output. One of his most successful designs was the salient pole synchronous motor with slip-ring winding in the faces of the poles.

The late Mr. W. R. Holland

Mr. A. J. Henning.—We regret to learn of the sudden death from heart failure at his home, Eaton Lodge, Kenilworth, on March 10th, of Mr. Arthur James Henning, A.M.I.E.E., A.M.I.Mech.E., commercial engineer to the Coventry City Electricity Department.

Wills.—Mr. H. C. Godsmark, general manager of the Newcastle-upon-Tyne transport and electricity undertaking since 1944, who died on December 24th, left £5,140 gross, with net personalty £5,071.

Mr. G. O. Tipping, A.M.I.E.E., of Moseley, Birmingham, formerly of Smethwick, Staffs, who died on June 27th last, left £5,650 gross, with net personalty £4,699.

Mr. H. R. Jolliffe, of 19, Nicholas Road, Barry, Glam., electrical engineer, who died on September 12th last, left £2,622 gross, with net personalty £2,566.

Mr. Albert Willis, of Eastbourne, electrical engineer, left £1,912 (net personalty £886).

PARLIAMENTARY NEWS

By Our Special Reporter

IN the House of Commons last week Mr. Palmer asked the Minister of Fuel and Power if he would give the names of the members of the Fuel and Power Advisory Council; the date of their appointment; and whether a qualified electrical engineer with knowledge and experience of the electricity supply industry was among their number.

Mr. Shinwell replied that this Council was appointed by his predecessor in 1944, and made a report on the subject of domestic heating in 1946. He then intimated to the Council that in view of the changed situation and requirements arising out of the Government's policy of nationalizing the fuel industries, he did not feel that it was necessary to keep the Council in being, and it was accordingly disbanded.

Electrical Plant Production

Referring to last week's meeting between Ministers and representatives of the boiler and electrical plant manufacturers, Mr. Greenwood said in a written reply to a question that suggestions then put forward were to be considered by a committee under the chairmanship of the Minister of Supply on which the Departments principally concerned, the electricity supply interests and manufacturers would be represented. A special organization based on wartime experience was to be set up to assist in planning production and overcoming difficulties and every endeavour would be made to ensure the necessary supplies of labour and material and to speed up production.

Supplies to Taylor, Tunnicliff

Mr. Edward Davies asked the President of the Board of Trade if he was aware that fuel supplies to Taylor, Tunnicliff & Co.'s Stone (Staffs) works, which produced components of electrical power and generating plant, and at their Longton works which produced switchgear required for housing had been cut to 30 per cent, and whether in view of the urgent need for these components he would take immediate action to make the maximum supplies allowed in priority industries.

Sir Stafford Cripps said he was informed by the Minister of Supply, that the case of these two works had been considered by the Regional Fuel Allocation Committee and, in view of the special importance of the production involved, a supplementary allocation of coal had been agreed.

Domestic Electricity Restrictions

Mr. D. J. Williams asked the Minister of Fuel and Power, if he was aware that miners living in prefabricated houses in South Wales experience severe hardships through the electricity cuts as electricity was the only means of cooking in these houses; that, as miners returned from work during the hours when the use of electricity was banned, they were unable day's work in the pit or to get hot water to to get their accustomed hot meal after their bath; and if he would take steps to mitigate these hardships.

Mr. Shinwell said that these difficulties were fully appreciated and the whole question of domestic electricity restrictions was being reconsidered.

Power Plant for Russia

Sir Waldron Smithers asked the President of the Board of Trade how much power-station machinery had been shipped to Russia during the year ended February 28th, 1947, and how much was still on order or in the process of being shipped; and, in view of the shortage, if he would cancel all further shipments.

Mr. H. J. Wilson said that detailed information for the year ended February 28th, 1947, was not available, but from the middle of 1945 until December 1st, 1946, the heavy electrical plant industry in this country delivered 261,000 kW of plant for Russia. That represented the balance of wartime orders. Orders on hand at December 1st, 1946, amounted to 74,000 kW. He could not agree to cancel further shipments.

Mr. F. Noel-Baker asked the Minister of Supply how many 10,000-kW generators were being manufactured for export to Russia.

Mr. J. Wilmot replied that there were none; but there were four generators, ordered and commenced in 1942, two of 12,000 kW and two of 25,000 kW, which should be ready for shipment during the next few months.

Unemployed Electricians

Major Vernon asked the Minister of Labour if he would state the extent of unemployment of electricians in the London area, and the proportion of the total which was due to lack of materials.

Mr. Isaacs said that on December 6th, 1946, the latest date for which an occupational analysis was available, there were 217 wholly unemployed men registered at Employment Exchanges in the London area for employment as electricians, wiremen, etc., and 88 as electrical fitters. The information asked for in the second part of the question was not available.

Telephone Instruments

In a reply to Commander Noble, Mr. Burke, Assistant Postmaster-General, said that at January 31st, 1938 and 1947 there were respectively 1,117,632 and 1,362,170 telephone instruments in the London area.

Electricity Bill

Area Boards as Retailers

THE question of the manufacture and supply of electrical fittings by the new Area Boards to be set up under the Electricity Bill was discussed in Standing Committee last week. Mr. Boyd-Carpenter moved an amendment to Clause 2 (Additional Functions of Electricity Boards) to provide that the prices to be charged for the sale of electrical fittings should not be less than the recognized retail prices unless the sale was to an electrical contractor or electrical retailer or other person who acquired the fittings for the purpose of supply to another person, in which case the prices should conform to recognized trade practice. These provisions should also apply to fittings supplied under a hire-purchase agreement. The prices for installation should include all overhead charges.

Present Suppliers' Anxiety

Mr. Boyd-Carpenter said that there had been considerable anxiety on the part of manufacturers and suppliers of electrical fittings as to the manner in which the powers under the clause might be used. It would be possible for the Boards, with their great resources behind them, to undercut and ruin the firms concerned, and having done that and having established a monopoly, to raise their prices to any extent they wanted.

Mr. Gaitskell, Parliamentary Secretary to the Ministry of Fuel and Power, said it certainly was not the intention of the Ministry that the Area Boards should come into this business with the design and intent of driving out the small firms and then securing a monopoly for themselves. On the other hand, he could not accept the amendment which tied down the Area Boards in selling fittings to what was called "the recognized retail prices" and thereby would deprive the consumer of any benefits which might accrue as the result of the greater efficiency of the Area Boards, or even of the larger scale of their undertakings. They were not preventing the Area Boards from making an agreement with other traders, if they so desired, but it was felt that they should not be under an obligation to do so.

Sir Arnold Gridley pointed out that the business of electrical contractors very often embraced the complete wiring and cabling of an enormous works, designing the general lay-out, and supplying motors of all sizes up to 500 or 600 H.P. Such contracts might run into £30,000 or £40,000. He imagined that the movers of the amendment had in mind that kind of business, with the possibility that the Area Boards might be able to raise money more cheaply than a private contracting firm could do. That would place the private contractor at a very serious disadvantage.

Mr. Shinwell, Minister of Fuel and Power, said that this did not relate to the provision of electrical plant on a big scale. The clause related specifically to the supply of electrical "fittings," that was all. He had received a deputation from the electrical contractors (the people who dealt in a small way of business, not the big firms), and he had discussed it quite reasonably with them. There was no reason why there should not be healthy competition.

On the other hand, he would regard it with disfavour if the Area Boards were to seek unduly, and in an unhealthy fashion, to subsidize the production of electrical fittings and thus enter into unfair competition with private traders. But that was hardly likely to happen, and it could, of course, be safeguarded when they considered the presentation of accounts. It was the intention of the Government (it was specifically provided in the Bill) that the electrical contractors, large or small, could be employed by the Area Boards as their agents. That was to the advantage of those traders. He envisaged a very considerable expansion of electricity throughout the country as a result of the Bill, and, in due course, a large number of people would be seeking to purchase or hire electrical fittings. He did not want them to do that just now—in fact, he wanted to suppress it—but when we had overcome our present difficulty we should expand the trade.

The amendment was, by leave, withdrawn.

Mr. Gaitskell accepted an amendment, moved by Mr. Boyd-Carpenter, to prevent the Central Authority directing the Area Boards to manufacture plant.

Generation and Bulk Supply

On the question that Clause 2 stand part of the Bill, Sir Arnold Gridley said that the Committee should be informed whether the Government envisaged the Central Authority as being solely responsible for the ownership and operation of power stations. Also, they were still in the dark about the terms on which the Central Authority would supply the Area Boards with electricity in bulk. If the Central Authority was going to impose on the Boards a rigid form of contract, those who would be responsible for selling energy to large consumers might find themselves very seriously handicapped.

Mr. Palmer believed that there was much to be said for the general centralization of generation because, unlike distribution, generation practice was to a large extent standardized. This centralization would make certain that the best expert advice was available to all existing stations and for the construction and design of new stations. It would also bring many

advantages from the point of view of research into the efficiency of stations.

Mr. Gaitskell said it was the view of the Ministry that the Central Authority would in general own and operate the generating stations, but there might be cases where it would find it convenient to delegate these powers to an Area Board. Such cases would not be very common, although he had one or two in mind. The terms on which bulk supplies would be given were, obviously, a matter of great importance, but it did not really arise on the clause. It was dealt with in Clause 33, and no doubt could be discussed further then.

On the Central Authority there would be four Area Board chairmen, whose presence should minimize the risk of disagreement between the Boards and the Authority. Under the new arrangements it would also be necessary for the Central Authority to negotiate with the Area Boards about exactly what persons should be paid by the Central Authority and who should be employed by the Area Boards.

The Clause was agreed to.

Constitution of Authority and Boards

There was a long discussion on Clause 3 (Constitution of Central Authority and Area Boards). Sir Arnold Gridley described this as the most important clause in the Bill, because something like 126 appointments were involved.

Mr. Gaitskell, replying, said that the Government proposed that for the Central Authority there should be a chairman, not more than six independent members, not more than four chairmen of Area Boards sitting in rotation, and the chairman of the North of Scotland Board, making twelve in all. The Minister had it in mind to appoint as full-time members of the Central Authori y the chairman and two deputy chairmen, but he did not intend that the other independent members should be full-time. The Area Board chairmen would, of course, be part-time members of the Central Authority.

The Minister had it in mind to appoint as full-time members of each Area Board the chairman and the deputy chairman, but not the other members. With regard to qualifications, it was administrative ability which was primarily needed. On the Central Authority they wanted people with the widest possible experience and with the greatest general ability. It was a delusion to imagine that Ministers enjoyed the very difficult and tiresome task of selecting people for these appointments. They had no intention that the period of service should exceed ten years; on the other hand, it would be unwise to tie themselves down to a period of not less than three years.

The Clause was ordered to stand part of the Bill.

On Clause 5 (Powers of Minister in relation to Central Authority), Mr. Shinwell, replying to Mr. R. S. Hudson and other members, said that it was desirable that the Authority and Boards should be independent and autonomous in character, and the less intervention there was from Whitehall, the better it would be. At the same time the Government was compelled to exercise independent supervision and vigilance in order to ensure that no action was taken which was inimical to the public interest. While the Minister would not exercise any direction as to the actual siting of a power station, it might be desirable for him to indicate that, having regard to strategical considerations, the Central Authority should exercise some discretion as to where the station was built.

The Government had decided to create development areas where factories were to be sited. It might, therefore, be necessary for the Minister to indicate to the Central Authority that it was desirable to provide electricity supplies in a particular area in order to fit in with the Government's economic policy.

There was a provision in the Bill which would empower the Authority to undertake research activities. There were extensive fields of exploration for the scientist and research worker in relation to the supply of electricity. There was a provision in the Bill which, in effect, was a direction to the Central Authority to proceed, as far as was practicable, with the process of conserving steam and waste heat for the purpose of assisting in social experiments such as district heating. It was difficult to see at this stage how far the progress of discoveries in the field of atomic energy would impinge on the activities of the Central Authority, but it might be possible to dovetail research into atomic energy into its activities.

After this statement an amendment was agreed to by the Committee providing that the Minister may give to the Central Authority "such directions of a general character as to the exercise and performance by the Authority of their functions under this Act as appear to the Minister to be requisite in the national interest."

Limitation of Expenditure

Mr. Gaitskell agreed to look further into sub-section (2) of the Clause, which reads: "In framing programmes of reorganization or development involving substantial outlay on capital account, and in giving directions with respect to the framing of such programmes by any Area Board, the Central Authority shall act on lines settled from time to time with the approval of the Minister." To this Sir Arnold Gridley had moved an amendment providing that the Central Authority should not, otherwise than in accordance with statements of policy from time to time notified by it to the Minister, either itself undertake or authorize Area Boards to undertake reorganization or development estimated to involve capital expenditure in excess of five million pounds.

Mr. Gaitskell said he could not accept that, but he would look into the whole matter again. On that assurance Sir Arnold Gridley withdrew his amendment.

Improving Electric Cookers

Suggestions for Increasing Efficiency and Convenience

By P. G. C. Wilding

IMMERSION elements are the most efficient for the heating of liquids (the efficiency of even a good hot-plate plus utensil being low[1]), but very little has as yet been done to encourage their use apart from the provision of an electric kettle connected to the control panel of each electric cooker. This is not enough.

Hot-plates cannot yet be dispensed with. I suggest, however, that there are three utensils of the immersion type which should be used with every electric cooker: namely, kettle, four-section steamer and porringer. These "unit" utensils should be plugged into sockets mounted on a standard "socket and control panel." One flex only would be supplied and this would be plugged in at one end to the three-pin, 3-kW outlet on the cooker control panel.[2] The other end would be equipped with a connector somewhat similar to the sockets mounted on the socket and control panel.

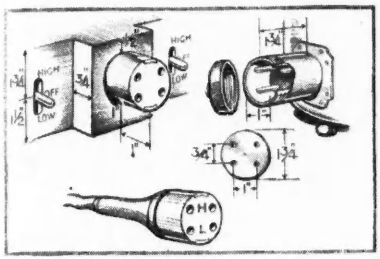


Fig. 1.—Details of connectors for "unit" utensils and sockets on control panel

A single heat is satisfactory for an electric kettle, but a steamer or porringer should have twin elements, one for boiling and one for simmering.[3]

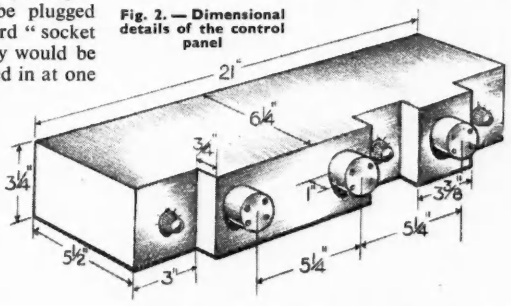
Adaptability and interchangeability can be secured only if manufacturers agree on the design of one standard four-pin and socket connector and also one standard socket and control panel for use in conjunction with the unit utensils.

The general lines on which the connector would be designed are indicated in Fig. 1. The four ends of the two elements on two-heat utensils are brought out to four pins arranged as a rectangle—one element to the top pins and the other to the bottom. On single-heat utensils the two ends from the element would be connected to the two pins which on a two-heat utensil would be connected to the higher loaded element. The pins would be surrounded by a metal cylinder (which would be used for earthing), threaded outside at the end to take a watertight cap for protecting the pins during cleaning.

A circular moulded block on the control panel would contain four metal sockets to fit the pins on the utensils. This block would have earth contacts which would press on the metal cylinder surrounding the pins on the utensil. The metal cylinder would completely cover the block when the utensil is plugged in. There should be some resilience in the method of mounting the sockets on the panel so as to prevent their being damaged when plugging in and unplugging the utensils.

All measurements would be standardized, including the height of the connector, on both panel and utensils, above the surface on which the utensils stand. The four connections from each socket on the panel would be connected to a change-over switch, with a central "off" position, the switch being up for high heat and down for low heat. Should finer regulation be required, infinitely variable heat controls connected to the "high" element sockets would be used in place of two-way and off switches.

Fig. 2.—Dimensional details of the control panel



The connector on the one flex mentioned would be similar to the metal sockets described above, except that there would be a cord grip for the flex and only one pair of the four holes in the block would have metal sockets and be connected to the flex. It would be interchangeable on all unit utensils; high or low heat on two-heat utensils would be obtained by reversing the connector. The connector would be marked "high" and "low" to correspond with the positions of the switches, the marking for the position actually in use being uppermost. Any one of the three utensils could, therefore, by means of the flex be used on either heat from the socket-outlet on the cooker-control panel or from any standard 3-kW socket-outlet. All the unit utensils would be equipped with an automatic resetting cut-out which would operate should they boil dry but would *not* eject the connector.

The dimensions of the socket and control panel, as indicated in Fig. 2, would be enough to take two unit utensils up to 10-in. diameter. The third utensil, if required at the same time, could be fed from the cooker control panel. The switches on the socket and control panel are recessed by $\frac{3}{4}$ in. in order to provide clearance for operation. Each socket would have a fuse incorporated in the panel.

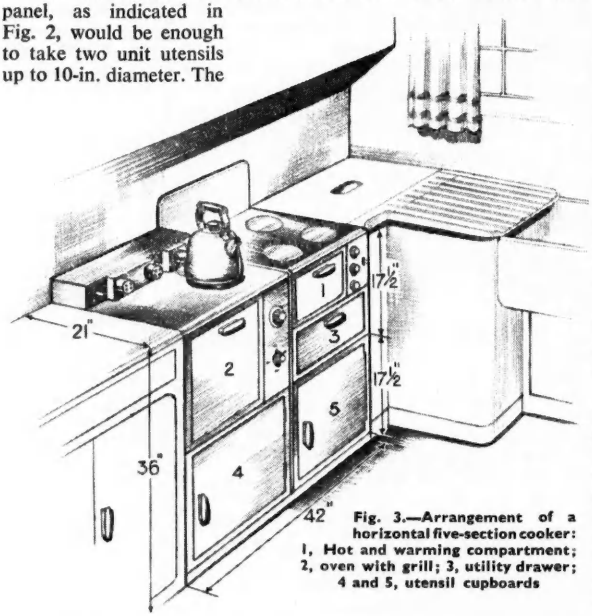


Fig. 3.—Arrangement of a horizontal five-section cooker: 1, Hot and warming compartment; 2, oven with grill; 3, utility drawer; 4 and 5, utensil cupboards

With the exception of kettles and other appliances requiring a handle on top, all unit utensils would have side handles, and their centre lines would be set at an angle to the connector to avoid congestion. Kettle spouts would also be set at an angle to the connector, and their handles would be in line with the spouts. On kettles 8 in. and less in diameter the spout would not project more than $3\frac{1}{4}$ in. and be in a similar position to that of the side handle farthest away from the connector on a steamer or porringer of corresponding diameter. On kettles over 8 in. and up to 10 in. in diameter, the spout would be on the opposite side and would project over the top of the socket and control panel. Larger unit utensils would be oval in shape (maximum width 10 in.) and would be plugged in to the centre socket on the panel, taking the place of the other two utensils. They would have handles at the ends and the connector would be in the centre of one of the long sides. One very useful extra-large utensil is an automatic table roaster.[4]

The socket and control panel can be used in a number of ways. Provided the necessary surface area is available, it may be fitted on top of the oven on a horizontal cooker, or on top of the utensil cupboard with a vertical cooker[5]: also one or more may be fitted to the kitchen counter, thus avoiding the use of flex.[6]

As the proposed standard connector is suitable for either single-heat or two-heat appliances, it could be applied to a large number of portable electrical appliances (e.g. waffle irons) thus obviating the present mix-up of different sizes and types of connector.

The cooker as a whole would be designed on the lines of a sectional book-case (Figs. 3 and 4). The measurements of the separate sections would be such that they could be built up into a horizontal or a vertical cooker at will, or the separate sections could be

incorporated in a complete unit-construction kitchen if required. The overall dimensions indicated in the sketches agree with those suggested in " Electrical Installations " (para. 175). The complete cooker would consist of five main sections, together with a short base in one or two pieces. The hob would be permanently joined to a warming cupboard with drop-down door and a separate 500-W element. There would be one or, preferably, two 8-in. diameter hot-plates of the enclosed radiant type with heat control, together with one 6½-in. diameter hot-plate of the same type with at least three heats. There would not be a grill-boiler. Switches would be grouped at the right-hand side with the fuses behind them.

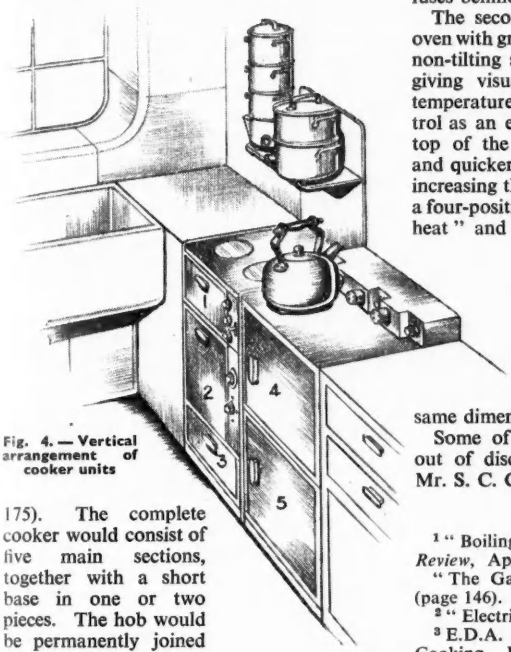


Fig. 4. — Vertical arrangement of cooker units

The second section would consist of the oven with grill equipped with drop-down door, non-tilting shelves, and thermostatic control giving visual indication when the desired temperature has been attained, with time control as an extra. The grill would be in the top of the oven, as this gives a large grill and quicker pre-heating to the oven without increasing the total loading. There would be a four-position switch, " Off," " Grill," " Pre-heat " and " Bake." The switch and thermostat would be grouped with fuses at the right-hand side of the assembly.

The third section would be a utility drawer of the same dimensions as the first section, and the fourth and fifth sections would be cupboard units of the same dimensions as the second section.

Some of the foregoing suggestions arose out of discussions between the writer and Mr. S. C. Green a few years ago.

References

[1] " Boiling Plates," by L. V. Turner. *Electrical Review*, April 27th, 1934.
" The Gas Salesman's Pocket Book," 1939 (page 146).
[2] " Electrical Installations," paragraph 55.
[3] E.D.A. " Electricity Service." Domestic Cooking. Page 9.
[4] " The Electrical Handbook for Women," page 318.
[5] " Electrical Installations," page 35.
[6] E.D.A. " The Design and Electrical Equipment of Houses and Flats." Page 15, fig. 16.

Safety in Mines

IN the recently published Report for 1945 of the Safety in Mines Research Board (H.M. Stationery Office, price 1s. net), the item of most direct electrical interest relates to the determination of " safe-gap " for enclosures of flameproof apparatus.

The idea that flange protection depends on the cooling of the flame gases by adiabatic expansion when escaping from the enclosure or by loss of heat due to conduction whilst they are in contact with the flanges has been abandoned. The most acceptable hypothesis, based on experiments described, is that the major factor is turbulence of the flame gases, which " drowns " the flame by minimizing the period of contact between it and an inflammable mixture.

Cold-cathode fluorescent lamps cannot ignite a methane-air mixture, but the short tubes required for coal-face lighting are little more efficient than filament lamps; hot-cathode lamps (50 W, 5 ft) present possible risks if broken during the heating-up period when current passes through both cathodes, but tests are being carried out with G.E.C. control filaments suitably exposed to an explosion mixture. Misfires with electrically ignited carbon shells and intrinsic safety of low powered circuits with copper-oxide or selenium rectifiers are also discussed.

India's Import Trade

Large Increase in 1945-46

THE accompanying table shows the imports of electrical goods into India during the fiscal year 1945-46, with notes of increases and decreases compared with 1944-45. The total value of imports of the group comprising electrical instruments, apparatus and appliances and parts in 1945-46 was nearly 45 million rupees, compared with 26 millions in 1944-45. Of the 1945-46 total, the United Kingdom accounted for over 33½ million rupees and the United States for just under 11 millions. These figures do not include radio materials which are classified elsewhere. Small decreases were shown in fans and accumulators. There were large increases in wires and cables, and lamps, notably from the United States. The value of electrical machinery imported also increased but to a less extent, possibly because of the 30 per cent advance between 1943-44 and 1944-45. Out of a total of over 32 million rupees in 1945-46, the United Kingdom accounted for 25½ millions and the United States for nearly 5½ millions.

The policy of India is to develop its engineering industry, including the electrical branches. In order to meet wartime demands there was an increase in the local manufacture or assembly of small motors, transformers, wires and cables, ceiling fans, lamps, radio material, batteries and various accessories. Much of this production was controlled by United Kingdom interests, and more than one British concern has in mind expansion of manufacture in India. Indian capitalists also have plans of this nature. The country has a long way to go before it can be independent of the old-established electrical manufacturing countries. Many more technicians and machine supervisors have to be trained and there must be greater facilities for the manufacture and maintenance of machine tools.

Meanwhile, to carry out the vast electrification programme planned by India will necessitate the import of large quantities of generating machinery, transmission and distribution material and accessory apparatus. The scope for expansion is very wide, as over half of India's supply of electricity is consumed in four cities which together contain less than 1½ per cent of the population of the country.

Equipment and Supplying Countries	1945-46 Rs. 000	Inc. or dec. on 1944-45 Rs. 000
Fans and parts	86	− 107
From United Kingdom	76	− 114
„ United States	10	+ 8
Wires and cables, rubber insulated	7703	+ 1599
From United Kingdom	7476	+ 1685
„ United States	224	− 88
Wires and cables, insulations other than rubber	9096	+ 3735
From United Kingdom	7858	+ 2605
„ United States	1238	+ 1146
Telegraph and telephone wires and cables	226	− 170
Telegraph and telephone instruments and apparatus	4049	+ 1710
From United Kingdom	3897	+ 1845
Gas-filled electric lamps	7333	+ 5163
From United Kingdom	3394	+ 1459
„ United States	3939	+ 3704
Vacuum electric lamps	1239	+ 743
From United Kingdom	828	+ 498
„ United States	411	+ 246
Electric lamps for automobiles	55	− 28
Electric bulbs for torches	744*	+ 466
Other electric lamps	1023*	+ 900
Parts and accessories for electric lamps	151	+ 79
Radio receivers, complete	704	+ 553
From United Kingdom	517	+ 420
„ United States	63	+ 43
Radio valves	403	+ 185
From United Kingdom	148	− 8
„ United States	254	+ 195
Component parts of radio receivers other than valves	986	+ 616
Other radio apparatus	508	− 75
Batteries for flashlamps	68	+ 51
Other batteries	444	+ 154

Equipment and Supplying Countries	1945-46 Rs. 000	Inc. or dec. on 1944-45 Rs. 000
Electric carbons	1114	+ 468
Accumulators	1207	− 174
From United Kingdom	1201	− 120
Electric condensers	494	+ 194
Electric bell apparatus	95	+ 39
Electric lighting accessories and fittings (inclu. switches)	537	+ 97
From United Kingdom	493	+ 67
Electrical instruments (other than telegraph and telephone):		
Meters	756	+ 264
From United Kingdom	601	+ 122
„ Switzerland	118	+ 117
Other instruments	974	+ 568
From United Kingdom	744	+ 401
Electro-medical apparatus	794	+ 212
From United Kingdom	203	+ 34
„ United States	589	+ 182
Switchboards, other than telegraph and telephone	529	+ 254
From United Kingdom	404	+ 129
Electrical porcelain ware	95	− 83
Electrical goods and apparatus not enumerated	5145	+ 1945
From United Kingdom	3902	+ 1611
„ United States	1197	+ 337
Control and switchgear	9553	+ 1782
Generators, alternators and dynamos	3263	+ 219
Motors	6973	+ 263
Transformers	3785	− 1579
Turbo-generator sets	604	− 437
Other electrical machinery	7980	+ 1772

* Mainly from U.S.A.

COMMERCE and INDUSTRY

Colliery Electrification Committee.

WE have already reported that the British Electrical Development Association was to set up a committee to investigate and report on the economies in fuel and operating costs which could be made by the extension of the use of public electricity supply in coal mines. At a recent meeting of the E.D.A. Council a recommendation that the following should be invited to serve on the committee was adopted: Messrs. N. S. Walker (North-Eastern E.S. Co.), K. L. Gaunt (Yorkshire E.P. Co.), L. Howles (South Wales Power Co.), P. Wardle (Cannock Electricity Dept.), A. G. Connell (Halifax Electricity Dept.); a representative of the Lancashire E.P. Co.; and a representative for Scotland to be nominated by the Area Committee.

Municipalities and Manufacturing Powers

Opposition to the granting of manufacturing powers to the proposed British Electricity Authority has arisen in municipal quarters. The Tynemouth Town Council has passed a resolution on the subject and is seeking the support of other local authorities. When the matter was discussed at a recent meeting of the Great Yarmouth Town Council the view was expressed that the manufacture of electrical appliances should be left to private interests so that play could be given to competition and invention. It was decided to support the Tynemouth resolution.

Safeguarding the Consumer

In a statement opposing the Electricity Bill the Manchester Chamber of Commerce proposes that an independent tribunal shall be set up to arbitrate upon electricity charges to protect consumers against the possible effects of monopolistic control of electricity supply. The view is put forward that there is no ground for believing that nationalization will reduce costs and charges.

Fleetwood Chief's Job

Efforts to prevail on the chief electrical engineer (Mr. W. P. Lilwall) to delay his retirement beyond May 31st having failed, the Fleetwood Corporation Electricity Committee is advertising the post at a commencing salary of £845, plus £60 bonus, rising to £1,095. Unsuccessful attempts were made to appoint instead a commercial manager at a lower salary, in view of the pending nationalization of the industry and on the ground that Fleetwood has ceased to be a generating authority.

The Mayor (Councillor W. F. Betney) considered that to fill the vacancy now would be "disastrous." There was no assurance that the engineer would be retained after it had been filled. One councillor suggested that Mr. Lilwall might continue in an advisory capacity, and another that a manager should be appointed from the local staff. Alderman Saer, chairman of the Electricity Committee, said that the Electricity Bill was not yet through and it was essential for a qualified man to watch Fleetwood's interest. If they attempted to appoint anyone at a lower salary they would be "blacklisted," as Bolton and Bury had been. Mr. Lilwall suggested that a saving could be affected if the department carried only two senior men on the staff instead of three.

Fleetwood Appointment Problem.

F.B.I. Conference

A one-day conference on Industry and Research, sponsored by the Federation of British Industries, will be held on March 25th at the Queen's Hotel, Birmingham. The general subject of the conference will be the application of science by industry, and the part research can play in promoting industrial efficiency, exports, and a higher standard of living, with special reference to industrial problems in the Midland area. Special attention will be given to the small manufacturing concern which cannot afford the cost of a research department, and to the research organizations and facilities which could serve it.

Welding Apparatus for Disposal

A considerable amount of welding apparatus has been declared surplus to Government requirements and is available for disposal to industry. The equipment includes specialized machinery manufactured for the production of tanks, shell cases, etc.; these units, with certain minor modifications, can be adapted for standard industrial use. Large quantities of standard petrol- and Diesel-driven d.c. arc welders, including spot (automatic and non-automatic) projection, seam and flash butt units are available.

Inquiries for the equipment should be addressed to the Ministry of Supply, Directorate of Disposals, D. (M.3), Room 550, Great Westminster House, Horseferry Road, London, S.W.1, giving complete technical details of requirements.

Surplus Generating Sets

The Ministry of Supply has disposed of surplus generators, engines and alternators in large numbers to users requiring them to provide electricity during the emergency. The type mostly in demand is Diesel a.c. three-phase 50-cycle, and the stock of these is now practically exhausted. If any further sets of this type

become surplus they will be offered for sale to users who have already made application, and whilst inquiries may still be addressed to Ministry of Supply, Director of Disposals (R.E.), Great Westminster House, Horseferry Road, London, S.W.1, where they will be noted in case it becomes possible to meet the requirement, the possibility of doing so is said to be remote.

There is still a stock of petrol a.c. three-phase 50-cycle sets, mostly of very small output (in the region of 1 kW) and both petrol and Diesel single-phase 50-cycle sets, also mostly of small output. A number of Diesel and petrol d.c. sets of various voltages with outputs varying from 200 kW down to 1 kW are also available for sale. Small capacity sets may be obtained from the Regional Assistant Directors of Disposals.

The C.S. "Monarch"

The cableship *Monarch*, 8,500 tons, sailed from Greenwich on March 11th, for St. Vincent, Cape Verde Islands, on charter from the Post Office to Cable & Wireless, to carry out important repairs and renewals of the Empire's cable system in the Atlantic. This work is part of a new post-war programme of restoration and modernization of the cable system estimated to cost several millions of pounds. Eight cableships in addition to the *Monarch* are already engaged on the work. Two more ships will be sent to join this fleet as soon as their services can be acquired.

"Operation I.C.L."

In common with other manufacturers, International Combustion, Ltd., put aside the manufacture of much of its normal products in order to devote itself to the war effort and in "Operation I.C.L." which the company has published, some indication of the scope of its work is given. This included making tanks proof against sandstorms, the construction of torpedoes, hand grenades, paravanes, Piat shoulder guns for anti-tank warfare, breech casings and mobile mountings, and corvette and frigate boilers. The story is well told and numerous illustrations showing some of the products and the purposes to which they were put add to the attractiveness of the publication.

Attracting Women to Industry

One of the suggested measures for building up the country's labour force is to encourage a greater number of young women to enter industry. To this end the Metropolitan-Vickers Electrical Co., Ltd., has produced a handsome brochure, with numerous illustrations, setting forth the opportunities for girls and the methods of training them in its various departments. On the manual side there are openings for small-part assemblers, bench hands, capstan operators, coil winders, drillers, core makers, packers, storekeepers and inspectors. Girls who have obtained the school certificate (with passes in physics or chemistry) can become laboratory assistants with facilities for further training, or technical assistants on estimating, etc. Higher posts are open to those who have passed the higher school certificate examination or have university degrees; these are eligible, too, for school or college apprenticeships. There are also opportunities in the company's offices.

About 20 per cent of the 18,000 employees at Trafford Park are women and girls. Further particulars are obtainable from the Chief Supervisor of Women, Women's Employment Department, Metropolitan-Vickers Electrical Co., Ltd., Trafford Park, Manchester, 17.

Fluorescent Stand Lighting

The stand of the Plessey Co., Ltd., at last week's radio component exhibition, was illuminated by fluorescent tubes. To overcome the effect of the power cut these were operated from 12-V batteries by means of heavy duty vibrator power packs produced expressly for the exhibition by the Plessey laboratory staff. This arrangement is of particular interest to stand designers and exhibition producers where no public electricity supply is available.

Damages for Husband's Death

Agreed damages of £1,600 and costs were awarded to Mrs. Annie Cook at Derby on March 10th in a claim against Balfour, Beatty & Co., Ltd. The defendants were the contractors for alterations to the Shardlow substation of the Derby & Notts Electric Power Co., at which the plaintiff's husband (a bricklayer) was working when he came into contact with a live cable and was killed. The cable was said to be unguarded.

Token Imports

Portable electric generators are included in the seventh list of commodities to which token import arrangements apply and may now be imported in token quantities from all the countries participating in the scheme.

Contract Price Adjustment Formulæ

In connection with the B.E.A.M.A. contract price adjustment formulæ, the latest rate-of-pay figure for adult labour (March 8th) is unchanged at 110s. Cost of material: The index figure for intermediate products last published by the Board of Trade on March 8th is 212·0 and is the figure for February (compared with 207·9 for January).

Retailers' New Showrooms

British Electronic Appliances, Ltd., a company composed of ex-Service men, last week opened showrooms at 341, Finchley Road, London, N.W.3. The company is at present confining itself to the retailing of domestic electrical appliances and radio and television apparatus, and it has a representative display of electrical

appliances made by leading manufacturers. The new showrooms are spacious and modern in design, and there are separate rooms fitted out for television and radio demonstrations, and kitchen equipment, including electrical refrigerators. Mr. P. A. Bligh, the managing director, tells us that in addition to the sale of appliances, the company will carry out installation work and the servicing of apparatus. Further showrooms are to be opened at 44, London Wall, E.C.2, and at 210, Kensington High Street, W.8.

Diesel-Electric Coaches for Iraq

An order has been placed by the Iraqi State Railways with the English Electric Co. for nine two-coach Diesel-electric units. Three of these units are for the standard gauge lines from Baghdad to Mosul, and the remaining six, of metre gauge, will be employed in generally augmenting the rail services out of Baghdad. Each two-coach unit will be fitted with an English Electric 275-H.P. Diesel-electric power unit, and will be capable of running at speeds up to 50 m.p.h. Units can be joined together, if necessary, to form a larger train. Saloon type accommodation will be provided for second and third class passengers, and the second class saloon is equipped with the latest type of air conditioning. The order also includes a 350-H.P. Diesel-electric shunting locomotive capable of starting and hauling trailing loads of up to 1,000 tons on standard gauge lines.

Some years ago the English Electric Co. supplied coaches of a similar type to Ceylon, and a repeat order is now in hand. An extensive programme is also under construction for the Egyptian State Railways covering Diesel-electric trains, express locomotives and shunting locomotives.

Swiss Industries Fair

This year Swiss Industries Fair is being held in Basle from April 12th to 22nd and the 2,100 stands will cover over 80,000 sq metres of space. Over 30,000 foreign visitors are expected.

Electrical Developments in Germany

Two reports issued by the British Intelligence Objectives Sub-Committee deal with "Electrical Factories in Berlin (British Zone)" and "German Developments in Semi-Conducting Materials" (Stationery Office, 3s. 6d. and 8s. 6d. respectively). The first contains, among other matter, an account of experimental schemes in hand for high-voltage d.c. transmission with especial reference to cables and rectifiers. The second document, prepared by the Joint Intelligence Objectives Agency of Washington, includes information on resistors, e.g., coated, "Urdox," "Urfa," "Urfi" and "Thermistor." The term "semi-conductors" refers almost exclusively to chemical compounds which conduct current in a purely electronic manner and have a specific resistance of between 1 ohm and 10^{10} ohms per cm.

Recovery of "Pluto" Lead

Operations are proceeding for the recovery of the lead piping employed in the "Pluto" scheme for transmitting petrol from this country to the Continent. It is anticipated that about 15,000 tons of lead will be recovered.

Church Fluorescent Lighting

St. Paul's Church, Harringay, has been entirely relighted with 5-ft 80-W "Osram" warm-white fluorescent lamps. During the day a small amount of light is admitted through windows along the aisles and above the altar.

Fluorescent lighting in St. Paul's Church, Harringay

The problem was to provide sufficient overall illumination to allow reading with comfort in every part of the church, and to illuminate the altar and reredos. The old system comprised 350-W tungsten lamps in pendant fittings, giving an overall intensity of less than one foot-candle, the altar and chancel being illuminated by six 500-W lamps in floodlights.

The new system has a total of thirty-four lamps in twenty fittings. The fittings at the nave and altar are ceiling type with curved reflectors, sprayed with plastic material and then colour sprayed ivory and silver. In the nave they are suspended from hooks in the timbers of the side aisles, between the columns and as near as possible to the apices of the arches. The mounting height is 15 ft. The average luminous intensity is about 3 ft.-candles. A war memorial screen at the back of the font is illuminated by a double-tube fitting. At the altar, by placing some of the lamps vertically,

the light source is completely invisible. The light intensity is from 8 to 10 ft.-candles. Although only 15 per cent of the former wattage is used, luminous intensity has been increased by 300 per cent. The lighting consultant was Mr. F. C. Orchard, chief electrical engineer, Hornsey Electricity Department, the wiring contractors were Sandilands, Ltd., and the lighting fittings were supplied by Linealux, Ltd.

"Radiolympia"

The Radio Industry Council announces that plans are now well advanced for the forthcoming National Radio Exhibition to be held at Olympia, October 1st to 11th.

Export Licences for Conduit

The Board of Trade announces that supply considerations have made it necessary to add steel conduit tubes for electric wiring to the schedule of goods requiring export licences.

Change of Address

The address of the British Empire Chamber of Commerce in the United States of America is now 55, Broadway, New York, 6 (telephone: Bowling Green 9-6181).

Changes of Name

A.C. & D.C. Meters, Ltd., have changed their name to Boldsworth Electrical Industries, Ltd.

The title of Pullars' Electric Co. (Brighton), Ltd., has been changed to Pullars Instruments, Ltd.

Dissolution of Partnership

Morgan & Co.—W. J. Morgan, W. L. R. Walter and A. H. Mainstone, trading as electrical engineers at 452, Badminton Road, Yate, Gloucestershire, have dissolved partnership as from December 31st, 1946. Debts will be attended to by Messrs. Morgan and Mainstone who will continue the business under the same style.

New "Atlas" Lamp Factory

The foundation stone of the new "Atlas" lamp factory at Cyfarthfa, Merthyr Tydfil, was laid by Mr. John Belcher, Parliamentary Secretary to the Board of Trade, on March 14th, in the presence of the Mayor, members of the Merthyr Tydfil Council and other guests. Mr. Jules Thorn, chairman and managing director of Thorn Electrical Industries, Ltd., was absent because of ill-health, and the chair at the luncheon which followed the ceremony was taken by Mr. A. S. Shier, director, who proposed the toast of the guests. In his response Mr. Belcher spoke of the progress that had been made in South Wales, and gave detailed figures of the Government's plans to absorb unemployment in that area. Mr. E. Brunning, joint managing director of the Wales and Monmouthshire Trading Estate, Ltd., also responded in the absence through illness of Sir Gerald Bruce, Lord Lieutenant of Glamorgan, and gave details of what that body had done in the Merthyr area where in the factories working at present the number employed exceeded 3,500, 43 per cent of them females.

Mr. S. T. Holmes, of Thorn Electrical Industries, proposing the toast, "The County Borough of Merthyr Tydfil," said that in bringing the electric lamp industry to Wales they were helping to fill a gap in the local economic system.

Alderman D. J. Morgan, Mayor of Merthyr, acknowledged the toast and Alderman S. O. Davies, M.P., proposing the toast "Thorn Electrical Industries, Ltd." read a telegram from Mr. Thorn. Mr. R. E. Davis, secretary, responding on behalf of the company, said that they had already begun the manufacture of vacuum cleaners at their Hirwaun factory and would later be making radio receivers there.

Trade Announcements

The whole of the share capital of the Carlisle Electrical Manufacturing Co., Ltd., has been acquired by Lloyds Packing Warehouses, Ltd. Mr. W. Taylor and Mr. S. H. Collings will be joined on the board by several of the directors of Lloyds Packing Warehouses.

Vickers-Armstrongs, Ltd., manufacturers of V.S.G. variable speed hydraulic transmission units and pumps, have appointed the Rockwell Machine Tool Co., Ltd., 83, Euston Road, N.W.1, as their sole selling agents in the United Kingdom for all industrial applications.

The transfer from Kingsway of their London offices to Morris House, 1-5, Jermyn Street, S.W.1, has provided Davidson & Co., Ltd., of Belfast, with more commodious accommodation, including estimating and drawing offices, for technical and general staff of nearly fifty who occupy the whole of the fourth floor.

The telephone number of the Electrical Wholesalers' Federation is now Holborn 7186.

INFORMATION DEPARTMENT

GENERAL inquiries from readers relating to sources of electrical goods, makers' addresses, etc., are replied to by our Information Department through the post. Inquiries should be accompanied by a stamped addressed envelope.

Our extensive records enable us to reply to most queries, but occasionally we ask for our readers' assistance in tracing names and addresses not known to us. We should be glad to have such information regarding the makers of the following:—

"C.E.L. Made in England" iron and kettle adaptors.

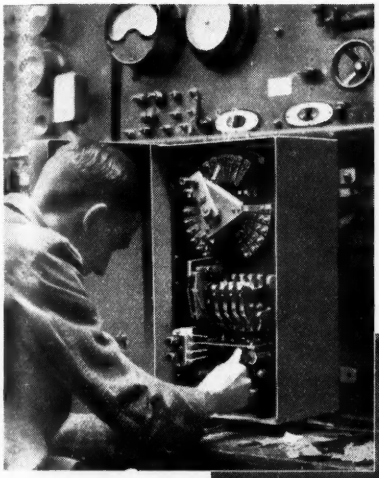
"Kingshome" or "Kingsholme" electric kettles.

"Easyway" shaving mirror.

Stepping-up Production

Successful Methods at New Self-Contained Factory

BY standardization of components and by breaking down to the greatest possible extent the individual processes of manufacture, the Airedale Electrical & Manufacturing Co., Ltd., is succeeding at its new factory at Apperley Bridge, near Bradford, in securing a large output of high-quality products, despite the use of a high proportion of unskilled or semi-skilled labour. Though electrical control gear of all kinds, including special equipment for textile work, forms the company's main business, the extra space available at the new works (which is four times the size of the old premises at Low Moor) is making it possible to extend the output of electronic and other products, which, marketed by a separate company, Applied Radiation, Ltd., include rectifiers, battery chargers, public address gear, impulse timers and soil-heating equipment.



Testing an air-break stator rotor starter for motors up to 20 H.P. and (right) assembling "92 B" direct-on-line contactors

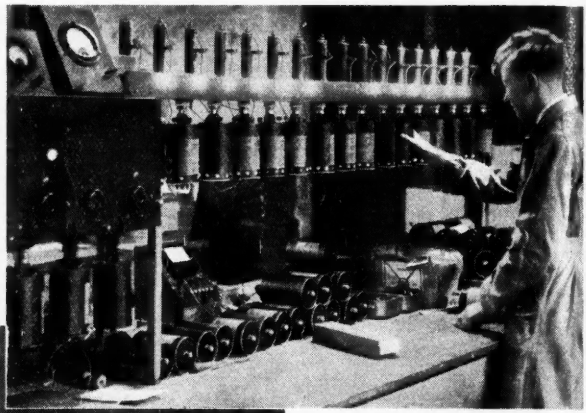
Explaining the production methods to us, Mr. L. E. Wood, the managing director, said that to overcome the difficulties of getting supplies of components from outside sources, the factory has now made itself virtually self-contained. Fabrication is employed almost exclusively instead of castings, and all the stampings are produced on the premises. All the coil windings, vacuum impregnation, tin and silver plating, painting, etc., are also undertaken in the works, such components as current transformers now being made complete.

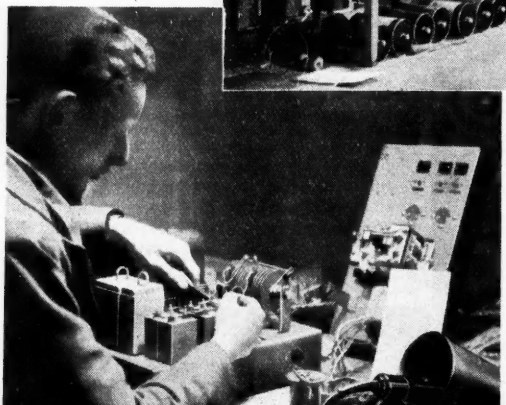
Thanks to the large degree of standardization achieved, it is possible to make up considerable quantities of sub-assembly items such as time-lags (from 7 sec to 2 min), starter handles, contact fingers, finished drums, no-volt assemblies, overload trip bars, push-button units and other components of complete equipments, and to store them in steel bins ready for use as required.

Normally about 25,000 components and sub-assemblies are available from stock. By the extensive use of rigs, assembly and wiring of apparatus have been rendered practically foolproof, but any faults are quickly revealed by routine tests. Facilities are provided for testing up to 6,000 A, with flash testing at 2,000 V.

Inspecting the large range of contactors from 12 to 600 A, which can be incorporated in many types of star-delta, stator/rotor and

auto-transformer starters, we were particularly interested in the construction of the smallest unit, the "92B" direct-on-line starter, for a maximum of 12 A. This neat apparatus measures only 7⅜ in. long by 7½ in. wide by 6⅝ in. deep, and the interlocking of the cover with the isolator ensures complete protection when the cover is open, it being impossible to get at the live wire without the need for dismantling the unit completely. Self and hand re-setting adjustable thermal overload units are fitted and terminals provided for remote start and stop push-buttons. The starter is built on the draw-out principle, which permits an interior to be withdrawn by the removal of two knurled nuts, thus giving the maximum facility for inspection and maintenance. A special feature of the design is the ability to withstand vibration, making the starter suitable for such situations as loom frames, etc. A range of five overload units is available, viz.: 0 — 1 A, 1 — 3 A, 3 — 4·5 A, 4·5 — 8 A, and 8 — 12 A.





Above: Small car-battery chargers undergoing test

Left: Wiring an electronic impulse timer for use with lubricating equipment in steel mills

Three types of oil circuit breakers are in production, for 50–100 A, 150–500 A and 600–1,200 A, all having loose handle features and incorporated in low-tension steel clad unit type flat-back or draw-out switchboards. Speed regulators are available for slip-ring induction motors up to 80 H.P.

Amongst the textile machinery control equipment, which is a speciality of the company, we saw in course of construction cloth guiding apparatus for use on tentering machines. This ingenious apparatus incorporates a 1/6-H.P. motor with magnetic clutches controlled by feeler fingers or photo-electric cells, according to the class of material. There was also a number of loom-reversing switches undergoing tests.

Colombo Port Facilities

WE are informed by the chairman of the Colombo Port Commission that the 60-ton pontoon derrick which has been operated at this port on account of the Ministry of Transport since 1944, is shortly to be withdrawn by the British Stores Disposals Board (Ceylon). The only heavy-lift cranes which will then be available will be the Guide Pier steam crane, maximum capacity 20 tons at 60 ft radius or 15 tons at 70 ft maximum radius and the 30-ton steam crane at the south side of the Graving Dock. The latter crane is available to make lifts from vessels in the dock.

ELECTRICITY SUPPLY

Croydon Test Case? Further Scottish Contracts.

Barrow-in-Furness.—ELECTRICITY SUPPLY.—The Corporation Electricity Committee is to provide supply to new industrial premises in the rural area at a cost of £39,600.

Bradford.—SUBSTATION.—A substation is to be constructed at Undercliffe at a cost of £1,530.

Cheltenham. — CHANGE-OVER.—The change-over from a.c. to d.c. in the Leckhampton area is to be carried out at a cost of £9,868.

LOANS SANCTIONED.—Sanction has been obtained to borrow £3,625 for the improvement of supply in the Brooklyn Gardens area and £1,202 for meter testing equipment.

FLUORESCENT STREET LIGHTING.—An experimental scheme submitted by the Revo Electric Co. for street lighting utilizing fluorescent tubes has been approved by the Corporation Electricity Committee.

Croydon.—POWER CUTS AND FIXED CHARGES.—It was suggested at a recent meeting of the Croydon Town Council that in view of the electricity restrictions the question of standing charges paid by industrial and domestic consumers might be made the subject of a test case. Alderman A. L. Boddington, opposing the allocation of £20,000 from the Electricity Department's surplus to the relief of the town rates, claimed that the money should instead be used to give some reduction in the form of a bonus to those who had contributed to it. Referring to the cuts in supply, he said that domestic and industrial consumers who paid standing charges on fixed bases, and who were unable to use electricity because of a Government order, should have some rebate for the services they were not getting. It was a matter of fair play. The amendment against the proposal to contribute £20,000 to rate relief was defeated by 25 votes to 21. After the meeting, however, it was stated that the point made by Alderman Boddington would be raised at the meeting of the Electricity Committee on April 14th. The matter has also come before the local Chamber of Commerce, whose secretary, as a private consumer paying a standing charge, obtained the advice of a lawyer.

Huddersfield.—LOANS.—The Electricity Commissioners have sanctioned the borrowing of £8,000 on unspecified substations and £1,857 on fire protection equipment at St. Andrews Road 33-kV switch-house and Yews Hill and Milnsbridge 33-kV substations.

Hull.—MEETING NEW DEMANDS.—Owing to rapid developments, the Corporation Electricity Committee is seeking sanction to borrow £163,437 for mains, £24,575 for substation buildings and £204,698 for substation equipment.

Ilford.—BULK SUPPLY.—The Corporation Electricity Committee has arranged with the County of London Electric Supply Co., Ltd., for the reinforcement of the bulk supply at a cost to the Council of £38,030.

Scotland.—PROGRESS OF POWER SCHEMES.—All civil engineering work in connection with the Mullardoch-Fasnakyle-Affric scheme of the North of Scotland Hydro-Electric Board, approved by Parliament only last month, is to be carried out by John Cochrane & Sons, Ltd., and the three 22,000-kW turbo-alternators for the Fasnakyle generating station will be supplied by the English Electric Co., Ltd. Plans have been completed for camps which will house 2,000 workmen.

The Board is also pressing ahead with its other major projects. At Loch Sloy construction of the tunnel through Ben Vorlich is proceeding, and the foundations of the generating station at Loch Lomondside are being excavated. At Pitlochry the site of the Clunie power station is being excavated and work is starting on the Clunie dam. At Fannich, accommodation camps are under construction and the Diesel plant which will supply electricity during construction is being assembled. The contract for the 3¼-mile tunnel has been placed with Balfour Beatty & Co., Ltd.

St. Pancras.—ELECTRICITY CHEAPER.—The Borough Council has reduced the initial charge under the rental wiring (small dwellings) scheme from 6d. to 5d. per kWh, a rebate of 1d. per kWh being given for all electricity consumed above the approved scale. The Brookfield Estate tenants' lighting tariff will be reduced by ½d. to 4½d. a unit. Prepayment consumers will pay 4d. instead of 5d. per kWh and one meter will be supplied free.

RATE RELIEF.—A sum of £15,244 from the profits is to be used to relieve the rates.

Wallasey.—HOUSING SUPPLIES.—The Corporation Electricity Committee is to extend mains to housing estates (£47,100).

Overseas

Australia.—PROGRESS IN VICTORIA.—A graph in the State Electricity Commission's annual report for 1945-46 shows that Victoria's rate of growth in electricity production exceeds that of the United States, Canada, Great Britain and all other Australian States. The Commission reports a net surplus for the year of £63,463, after appropriating £300,000 to aid rural development, £100,000 for contingencies, and £125,000 to meet expenditure in respect of arrears of maintenance which accumulated during the war. On the production of briquettes there was a loss of £23,994 due to high production costs. Revenue from electricity supply

was £5,605,333. The maximum coincident demand on generating stations was 377,100 kW, an increase of 7·2 per cent on 1944-45.

Belgium.—POWER SUPPLY RECOVERY.—From a Brussels correspondent we learn that the Belgian electric power stations, notwithstanding that many difficulties have still to be contended with, are rapidly getting back to, and in some cases exceeding, their pre-war outputs. The total output last year was 6,243 million kWh, as compared with 4,525 million kWh in 1945 and 5,798 million in 1939.

As in Great Britain, the peak demand is greater than the capacity of the generating plant, and although large orders for additional plant have been placed by all the principal electric power supply concerns, owing to the shortage of material and labour it is feared that it will not be possible for output to catch up with demand until towards the end of 1948.

France.—ELECTRICITY RESTRICTIONS TO END.—All restrictions on the use of electricity in France are to end on March 24th. Because of the shortages of power and coal earlier this winter French factories had to reduce production and domestic consumers had to manage without electricity during most of the day-time for three days a week during the worst part of the shortage.—*Reuter* (Paris).

Newfoundland.—WATER-POWER SURVEY.—A two-year survey has begun of possible hydro-electric development in Newfoundland and Labrador, including the harnessing of the 315-ft Grand Falls, on the Hamilton River, Labrador.—*Reuter.*

E.D.A. Scottish Area Lunch

THE annual luncheon of the Scottish Area of the British Electrical Development Association was held in Glasgow on March 13th. Mr. H. I. Hulme, chairman of Scottish Area Committee, presided. Mr. Tom Johnston, chairman of the North of Scotland Hydro-Electric Board, was the principal guest and proposed the toast of the Association. He said that the North of Scotland Hydro-Electric Scheme aimed at harnessing for the use of the community a vast amount of power now running waste to the sea. In three years they expected to meet half of Scotland's demands and eventually to produce one-seventh of Britain's total requirements.

While the time was not ripe for speaking about domestic electrical equipment, they hoped very quickly to establish an increase of agricultural productivity in the North of Scotland. This year they planned a big experiment in hay drying by electricity on the island of Bute. The figures supplied by experts showed that at least one-third of the total hay crop of North Scotland area was lost, even in good summers, through the disappearance of the protein during a single month of drying in the open air. It was hoped to effect a saving of at least £1,800,000 per annum.

Mr. H. J. Randall, chairman, E.D.A. Council, who was to have replied to the toast, had only got half-way from London, his train having been snowed up. Mr. J. W. Cooper, burgh electrical engineer, Hamilton, who responded instead, said he did not think the public realized how electricity multiplied the power of man. There was no more effective way of increasing productivity. Speaking of the loss of about 60 per cent through the conversion of coal to electricity by allowing cooling water to go to waste, Mr. Cooper said that there should be a way of recovering a great amount of this heat. Lord Provost Powrie, Dundee, proposed the health of the guests, and Mr. Melville Dinwiddie, Scottish Director, B.B.C., replied.

Mid-East England Scheme

THE Central Electricity Board has received from the Electricity Commissioners a further Amending Electricity Scheme for Mid-East England providing for three new generating stations with first sections each comprising an installation of up to 130,000 kW of generating plant to be constructed and become selected stations.

In making representations to the Commissioners for the formulation of the present Scheme, the Central Electricity Board pointed out that two new selected stations specified in an earlier Amending Scheme for the area had already been allocated and indicated that, as the result of a review of the prospective plant requirements, they had come to the conclusion that it would be necessary to take steps for the establishment of at least three other new stations. Of these it is proposed to situate one on the River Trent in the vicinity of Keadby, one will probably be required in the west of Yorkshire, and the other in the south of Yorkshire to meet the increasing load in later years.

Copies of the Scheme, entitled the Mid-East England Electricity (Alteration and Extension) Scheme, 1947, together with an explanatory memorandum by the Commissioners are on sale at H.M Stationery Office.

Generation in February

THE Electricity Commissioners report that 3,680 million kWh was generated (3,474 million sent out) by authorized undertakings during February, compared with 3,462 million kWh in February, 1946, an increase of 6·3 per cent. This check on the rapid upward movement of consumption is a reflection of the restrictions imposed during the month. The 1946 advance over 1945 was 10·6 per cent. During the first two months of 1947, 8,351 million kWh was generated (7,898 million kWh sent out) compared with 7,604 million kWh for the equivalent period of 1946, an increase of 9·8 per cent.

Progress in Manufacture—III

Many Important Export Orders

FROM the manifold activities of the **General Electric Co., Ltd.**, the following items have been selected as typical. Of the four 30,000-kW turbo-alternators for Meaford power station (West Midlands J.E.A.), two are being erected on site (*Electrical Review*, January 31st). Three others for approximately the same output are being constructed or have just been installed for the Hull, Woolwich and Newport Corporations, with two more each for Haifa and the Orlando power station, Johannesburg, which bring the total there to five. In addition the North of Scotland Hydro-Electric Board has ordered three vertical-shaft 27,800-kVA 4-kV alternators for the Errochty station. Hydrogen cooling of alternators continues to be the subject of active investigation.

Marine electrical propulsion and auxiliary equipment in hand include a 6,940-kW 3,220-r.p.m. turbo-alternator and a 9,000-S.H.P. 124-r.p.m. salient-pole motor for a single-screw tanker. Rheostatic braking with limited regeneration is to be employed for sixty-five trolley-bus equipments ordered by Cardiff Corporation. Orders for Belfast Corporation will bring the total number of such equipments in service in that city up to 182.

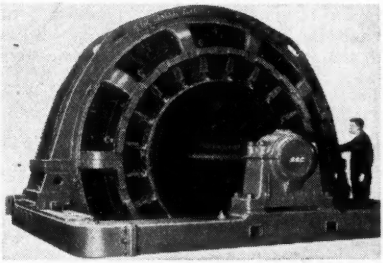
Steel-tank Rectifiers

Nine 2,000-kW and thirteen 1,500-kW pumpless steel-tank mercury-arc rectifiers are being installed on the eastern extension of the London Underground railways.

Very large demands for "Mutac" micro-gap switches, which break a.c. up to 5 A, are reported both for housing and export; tests show a useful life of 100,000 operations as against 12,000 required by B.S. Models rated up to 10 A are projected. A new on-load tap-changing switch has been designed for use with 132-kV transformers with earthed neutral, 66-kV fully insulated transformers and the larger sized 33-kV units; it can be rail-transported in position.

A 10,000-kVA condenser for the Reading power station (Palestine), operating normally at zero leading power factor, is also, at light loads, required to provide 4,000-kVA at zero lagging power factor. A d.c. winder motor (4,000 peak H.P.) associated with a Ward-Leonard set driven by a 1,800-H.P. 2·2-kV 500-r.p.m. slip-ring motor and a 1,500-H.P. salient-pole synchronous motor, replacing a steam engine, for driving a 30-ft. 120-r.p.m. ventilating fan, both for South Africa, are other representative examples of overseas requirements to be met.

Further notable industrial electrical equipments on order include the following:—New Shimshon Portland Cement Works in Palestine (power station plant of 9,000 H.P. and a.c. motors); a Robins-Messiter ore bedding and blending plant by Fraser & Chalmers at Stewart & Lloyds, incorporating 80 motors and sequence control panels totalling 25 ft in length; and 400- and 5,000-V a.c. motors of from 75 to 600 H.P. for the Dunlop Rubber Co., the larger machines having the primary circuit connected to the slip rings and the starting gear to the stator.



G.E.C. 2,140 H.P. 57-r.p.m. winder motor for the Crown Mines, Johannesburg, S.A. The compensated motor has a peak rating of 4,075 H.P.

A new range of capacitor starter single-phase motors of 0·5, 0·75 and 0·9 H.P. has been introduced, the first named being also arranged for split-phase starting. Loom motors have been largely re-designed in a range of seven ratings from ½ to 3 H.P. Silicone-resin, fibrous-glass, glass-type and mica-glass insulations can be supplied for machines operating under high-temperature and other tropical conditions or for giving higher output for a given weight.

Among the electric furnaces introduced are a rotary hearth for brass billets (850 deg. C)

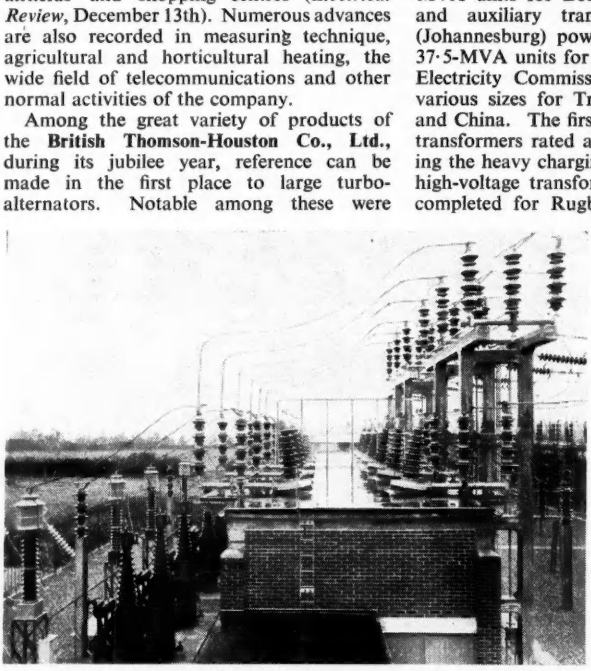
Previous articles in this series appeared in the *Electrical Review* of February 14th and March 7th.

and a continuous-flow batch model for annealing thin aluminium sheet. A new medium-intensity radiant-heat oven fills a gap in this field. In addition to dielectric applications of r.f. heating, non-metallic material has been brought to above 2,000 deg. C by eddy currents induced in a lagged graphite crucible, a neutral atmosphere being provided.

Progress has been made in illumination, especially in connection with cinema studios, airfields and shopping centres (*Electrical Review*, December 13th). Numerous advances are also recorded in measuring technique, agricultural and horticultural heating, the wide field of telecommunications and other normal activities of the company.

Among the great variety of products of the **British Thomson-Houston Co., Ltd.**, during its jubilee year, reference can be made in the first place to large turbo-alternators. Notable among these were orders for three 75,000-kW 1,500-r.p.m. three-cylinder sets for Barking " C " (County of London Co.) and two 60,000-kW 3,000-r.p.m. two-cylinder sets for Balfour Beatty & Co., all with steam conditions of 900 lb and 900 to 925 deg F. Machines being erected include two of 30,000 kW for Nottingham, another for Leeds and one of 20,000 kW for Bonnybridge (Scottish Central Power Co.). Export orders received from Australia, Madras, U.S.S.R., Czechoslovakia, Burma, Malaya and China have been for units of from 1,500 to 7,500 kW. A further 7,250-kVA 600-r.p.m. vertical unit being built for India is illustrative of hydro-electric activities.

Four 132-kV transformers of from 15 to 45 MVA are in hand for the Central Electricity Board, one of them for supplying the Atomic Research Establishment at Harwell. Other home orders for lower voltages include two of 30 MVA for North Tees station (NESCO) and two of 37 MVA for Wigan. Typical of export orders are five 88-kV, 8-MVA units for Bombay, two 88-kV banks and auxiliary transformers for Orlando (Johannesburg) power station, three 66-kV, 37·5-MVA units for Newport (Victoria State Electricity Commission), and a number of various sizes for Travancore, Madras, Iraq and China. The first of three 362-kV testing transformers rated at 1,650 kVA for supplying the heavy charging current taken by very high-voltage transformers of the future was completed for Rugby. A big demand for cast-in-concrete and oil-immersed reactors is reported.



132-kV, 1,500-MVA " Aerojet " circuit breakers are installed at the C.E.B. substation, Andover

Resistance switching is incorporated in six indoor type 132-kV " Aerojet " circuit breakers installed in the C.E.B. substation at Andover. An all-porcelain blast head with simplified contacts has been fitted to a 110-kV 1,000-MVA " Aerojet " breaker for the Madras Government. Resistance switching has also been incorporated in a new design of oil circuit breaker for 2,500 MVA at 110 and 132 kV capable of operation in three cycles; auto-reclosing features can be added if required. New single-break oil circuit breakers with self-compensated arc-control chambers instead of cross-jet boxes are in production for from 3·3 to 11 kV. A large order has been completed for truck-type switchgear with improved arc-chute for 150 MVA at 3·3 kV. New flameproof switchgear having an internal six-pole rotary isolator with contacts for 3·3-kV duty in mines is in production. Miniature control panels being made for Nottingham Corporation enable the instruments, switches and

indicators controlling one generator or two feeder equipments to be accommodated within a 12-in. wood panel.

The marine department has been actively engaged in making equipment for electrically propelled vessels. One order relates to a four-engined Diesel-electric tanker using a.c., one of the engines of which is to be later replaced by a combustion-turbine (*Electrical Review*, March 7th). An electromagnetic coupling is to be applied to speed reduction, Diesel to helical gear box, on a collier. Both turbo- and Diesel-electric sets, operating on the constant-current or the constant-voltage system, are being used for auxiliaries in the *Monarch*, the first electrically driven cable-laying machinery to be installed in an ocean-going ship.

For the L.M.S. Railway a 70-ton Diesel-electric locomotive is to be supplied for mixed-traffic duty. A fourth shunting locomotive for the Kearsley power station (Lancs. E.P. Co.) with contactor control has been commissioned. Two motor-coaches are being shipped for the Bombay, Baroda and Central India Railway. An order for a further 225 train control equipments has been received from the London Passenger Transport Board.

Recent orders for trolley-bus equipments include 52 for Wolverhampton, 15 for Derby and 12 for Mexborough, all fitted with flood-proof motors. Orders are now in hand for 500 battery-vehicle control gear and motors.

Exports for mining include winders of up to 3,000 H.P. For home collieries a.c. and d.c. winders of from 30 to 2,000 are in hand as well as a large number of schemes for replacing rope haulages by conveyors. An example of rolling-mill drives is provided by one of 4,850 H.P. for a 32-in. reversing structural mill for the Cargo Fleet Iron Co., with amplidyne control to give automatic load limiting and field forcing. This type of control is being applied to other installations of the same nature. Typical of overseas demands are induction-motor drives for a steel works in Rhodesia, namely a 1,000-H.P. roughing mill and a 1,500-H.P. associated finishing mill.

Included in the contracts from home and abroad for paper mills is one for a.c. sectional drives and auxiliary machinery from South America. Numerous variable-speed drives are being supplied with a.c. commutator motors up to 200 H.P., some with electronic speed regulators. Many thousands of fractional-horse-power flameproof motors have been produced for kerb-side petrol pumps. Hermetic refrigerator units in large quantities are being made for the Government housing programme.

Recent researches into electronics, insulation, ignitrons and hot-cathode thyratrons have resulted in several promising developments. In the lighting field, perhaps the most striking example is furnished by the use of fluorescent lamps for street lighting, which was described in the *Electrical Review* of September 20th.

Electricity as an Anæsthetic

Australian Method for Surgical Operation

A METHOD of inducing anæsthesia by electricity has been developed by two young medical students in Australia, Mr. Samuel Rose and Mr. Donald Rabinov. Their experiments have shown that it is possible to put human beings and animals to sleep for long periods without any ill-effects upon respiration or the heart.

The apparatus used was specially designed by the Australian Council for Scientific and Industrial Research. It has the appearance of a small mantel radio set and is energized from an ordinary household power point. It could be designed for operation by a battery if this was necessary.

Three valves of types which are readily available in most countries are utilized. A normal twin triode is employed as an oscillator, the frequency of which can be varied from a little below 100 c/s to a little above. An output power pentode supplies pulses of up to 150 V peak amplitude and of a duration of the order of half a millisecond.

A peak power of 5 W has been found satisfactory, but as the output is a series of pulses the average power level is low. When operating from a.c. mains the usual rectifier and filter circuit are needed to supply d.c. to the valves. The only controls provided are two small knobs, one varying the amplitude of the output pulse and the other exercising 10 per cent control of its repetition rate.

The apparatus is connected to the patient by two applicator electrodes, one upon the forehead and the other in contact with the lower portion of the back. The patient gradually becomes drowsy and does not awake until the current is switched off. In tests carried out a short time ago at a Melbourne hospital patients did not suffer any ill-effects from the use of 120 V and the imparting of 100 impulses a second.

NEW BOOKS

Record of Telephone Development. Electricity Principles for Students.

The History of the Telephone. By J. H. Robertson. Pp. 299; index. Sir Isaac Pitman & Sons, Ltd., Parker Street, Kingsway, London, W.C.2. Price, 10s. 6d.

This unique and fascinating book is not merely a history of the telephone, but an account of the development of the telephone industry in Britain. The author, a journalist, undertook the work at the request of the Telecommunication Engineering and Manufacturing Association and with no knowledge at all of the telephone industry, but with the help of a number of people in the industry whose aid he freely acknowledges, he has produced an extraordinarily interesting and beautifully written volume.

The first part of the book is concerned with the invention of the telephone itself, in which the author has drawn largely on Kingsbury and Baldwin with due acknowledgment. In 1880 a judgment of the High Court that a telephone was a telegraph and that it therefore infringed the Postmaster-General's monopoly under the existing Telegraph Acts was the first serious blow that the young industry received; that and the subsequent results are very completely detailed by the author from that date up to 1890. The invention of Strowger's automatic system is mentioned at this point.

The following chapter deals with the unification of the various telephone companies which had come into existence at that time. The Post Office developments are also fully dealt with. The author is somewhat scathing in his remarks on municipal activities in the telephone field. The whole of this chapter presents a very complete picture of the attitude of Parliament at this time. Charges of monopoly and excessive rates were being levelled at the National Telephone Co. From 1896 the position was that the Post Office held all the trunk lines while the N.T. Co. controlled the local exchanges. December 31st, 1911, was the date on which private enterprise in telephone operation came to an end. It was then that the manufacturing side of the industry began to develop, and the author fully details the growth, more particularly the development, of automatic or machine switching systems. This section is very well done and a graphic and a very complete picture is displayed before the reader.

Chapter 8, which is one of the most interesting, deals with the problem of telephoning London by means of machine switching. The American telephone industry was then engaged in converting the New York system to automatic operation and was consulted by the Post Office. Laidlaw and Grinsted had developed and published a plan which was ingenious, but contained features to which the Post Office raised objections. Finally the A.T.M. Co. produced the "Director" which, applied to the Strowger system, solved the problem and was adopted as the standard by the Post Office. The behind-the-scenes negotiations are fully disclosed.

One could have wished that some of the "back room boys" had received mention here, notably the late Mr. C. H. Gillings. The formation of the Telephone Development Association and its activities are described and the book concludes with a résumé of the industry's wartime efforts.

A most excellent book. Those who have Kingsbury and Baldwin on their shelves should add this volume to them. The student of telephone matters should read it, while those interested in industrial affairs will find its perusal well worth while.—H. H. H.

The Principles of Technical Electricity. By M. Nelkon, B.Sc. Pp. 240; figs. and index. Blackie & Son, Ltd., 66, Chandos Place, London, W.C.2. Price, 17s. 6d.

It has been a pleasure to read this book, which is intended to reach the standard required for the City and Guilds technical electricity examinations. Despite the number of books on elementary principles, the author shows there is room for a treatment to suit the needs of the rapidly increasing number of students interested in the electronic and communication side of engineering. Thus, particular emphasis is laid on the elementary side of bridges and of resonance circuits.

On the whole the chapters are fairly well balanced, though the space devoted to the basic principles of valves is scarcely enough for a beginner. Throughout the text there are numerous worked examples and a selection of problems with answers is given at the end of each chapter. Some of the numerical results might be checked. The book is well produced, both as regards text and diagrams.—S. P. S.

Television Receiving Equipment. By W. T. Cocking. Pp. 350 + 30; figs. 210. Second edition. Iliffe & Sons, Ltd., Dorset House, Stamford Street, London, S.E.1. Price, 12s. 6d.

There have been six impressions of this book, much of the information it contains having been equally applicable to wartime radar work. Meanwhile commercial television practice in Britain has not changed fundamentally, but there have been a number of detail improvements which are of importance. They are dealt with fully in this second edition, which has been enlarged by 48 pages and new appendices. Complete revision has improved the presentation in some sections and provided more detailed information in others.—W. O. F.

FINANCIAL SECTION

Company News. Stock Exchange Activities.

Reports and Dividends

Johnson & Phillips, Ltd.—At an extraordinary meeting held on March 11th a resolution was approved increasing the capital of the company from £1,000,000 to £1,067,000 by the creation of 67,000 new ordinary shares of £1 each. Mr. G. L. Wates (chairman and managing director), who presided, said that the desirability of a closer link with the Telegraph Construction & Maintenance Co., Ltd., had arisen from discussion between the technical staffs of the two companies, and the directors felt that with the closer association some financial link was desirable and an exchange of shares was decided upon. Each company would maintain its present identity, commercial contracts, trade names and general trading arrangements so that the tradition and goodwill which existed in both these companies would remain unimpaired.

The British Aluminium Co., Ltd., in a preliminary statement, reports a profit of £1,368,095 for 1946, after deducting E.P.T., as compared with £1,019,440 for 1945. After providing for directors' fees, income tax, debenture service and depreciation, and placing £200,000 to general reserve, it is proposed to pay a final dividend of 8 per cent on the ordinary stock (against 6 per cent), making 10 per cent, less tax, for the year (against 8 per cent). The balance carried forward is £308,361, an increase of £22,845.

Mather & Platt, Ltd., report a balance on revenue account of £304,740 for 1946, as compared with £303,989 for the previous year, and a net profit of £145,428 (against £107,316). Reserve receives £50,000 and it is proposed to pay a final ordinary dividend of 7 per cent (against 6 per cent), making 11 per cent for the year (against 10 per cent). The balance carried forward is £88,401 (against £91,474 brought in).

Power Securities Corporation, Ltd.—In his address at the annual meeting, Mr. W. Shearer, (chairman and managing director), referring to the debate on the Electricity Bill, said he would like to make it clear that neither their corporation nor the various groups of electricity undertakings for which they carried out services had any special arrangements with manufacturers, and the orders for plant and materials were subject to open competition. Dealing with work carried out during the past year, he said that on the electrical engineering side work had been completed in this country in 1946 to the value of over a million pounds, covering power station extensions in Scotland and the Midlands, and extensive development of main transmission lines and substations. A contract had been placed with them by the North of Scotland Hydro-Electric Board for a 132-kV steel-tower line which would eventually carry power generated at Loch Sloy to Glasgow. Work had been started on the site of the new Staythorpe generating station on the River Trent, and they were also engaged on the design of the Carmarthen Bay station. Overseas, extensions had been carried out to the Pagani hydro-electric station in Tanganyika, new power units had been installed in Jerusalem, where there had been a tremendous demand for electricity in the last year or two, work had been carried out for the Perak River hydro-electric undertaking in Malaya, and in Ethiopia they continued to manage the electricity undertaking on behalf of the Custodian of Enemy Property. The total amount of electrical engineering work on hand at the moment at home and overseas amounted to a value of upwards of £15,000,000. The volume of financial business which they transacted in 1946 was greater than ever before. Regarding their Italian interests, he said they had authorized their legal adviser in Italy by power of attorney to submit their claim for due payment in sterling of the sums owing to the corporation.

The Northmet Power Co.—The accounts of this company were reviewed in our issue of March 7th. In the full report and accounts it is stated that sales of electricity during 1946 totalled 1,219·9 million kWh, an increase of 161·5 million kWh as compared with 1945. The number of consumers supplied directly or indirectly by the company rose by 11,869 to 448,827, and the number supplied directly was 349,590, an increase of 8,501. Dealing with the Electricity Bill the report contains a table showing how holders of the company's stocks will be affected, on the assumption that the British Electricity Stock is to be issued on the same terms as Transport Stock.

The South London Electric Supply Corporation, Ltd., reports a balance on revenue account for 1946 of £192,758, as compared with £142,733 for 1945, to which is added £3,844 surplus on the sale of Government securities. After providing for sinking fund contributions, tax, and other charges, it is proposed to pay a final ordinary dividend of 4 per cent, maintaining the distribution for the year at 7 per cent, and to carry forward £10,924 (against £426 brought in).

The Bournemouth & Poole Electricity Supply Co., Ltd., reports a total revenue for the year ended December 31st last of £922,028, as compared with £817,409 for the preceding year, and a net balance of £264,441 (against £229,961). After providing for depreciation reserve, taxation, etc., it is proposed to pay a final ordinary dividend of 7½ per cent, again making 12½ per cent for the year. The balance carried forward is £41,778 (against £39,421 brought in).

The Newcastle & District Electric Lighting Co., Ltd., reports a profit for 1946 of £86,077, as compared with £82,194 for 1945, which with a balance of £14,620 brought in makes £100,697. The dividend for the year is unchanged at 7 per cent, less tax, and £15,435 is carried forward.

Midland Electric Corporation for Power Distribution, Ltd.—Profits for 1946 amounted to £228,097 (against £188,366). Tax absorbs £134,563 (£98,047) and after meeting debenture interest, and placing £20,000 (same) to reserve, the ordinary dividend for the year is maintained at 9 per cent by a final payment of 6 per cent.

South Metropolitan Electric Light & Power Co., Ltd.—The revenue balance for 1946 amounted to £313,563 (against £321,603), to which is added £25,378 (nil) surplus on sale of Government securities (last year £19,117 was brought in from reserves not required). After depreciation, etc., providing £80,000 (£75,000) for taxation and allocating £7,000 (nil) to contingencies, the ordinary dividend is maintained at 7 per cent.

West Kent Electric Co., Ltd.—To the revenue balance of £155,078 for 1946 (against £142,951 for 1945) is added £13,056 (nil) from sale of Government securities (last year £83,653 was brought in from reserves). After depreciation, etc., and allowing £44,000 (£48,000) for tax, contingencies reserve receives £20,000 (against £75,000 to general reserve). The final ordinary dividend is 7 per cent, again making 10 per cent for the year.

Richmond (Surrey) Electric Light & Power Co., Ltd.—The revenue balance for 1946 was £31,711 (£31,758), to which is added £2,294 (nil) surplus on sale of Government securities. The ordinary dividend is again 6 per cent.

Hoover, Ltd., report a record trading profit of £773,136 last year, compared with £598,001 for 1945. After bringing into account £109,000 from reserve, taxation takes £314,166 (£317,513). General reserve and research reserve again receive £100,000 and £30,000 respectively, and £50,000 (nil) is allocated to the employees' superannuation scheme. The ordinary dividend is raised from 30 to 40 per cent and £133,950 (£50,973) is carried forward.

J. & E. Hall, Ltd., report a trading profit, plus income from other sources, of £437,855 for the year ended September 30th last, as compared with £339,990 for 1944-45, and a net profit of £55,772 (against £53,911). The ordinary dividend for the year is unchanged at 10 per cent and £137,072 is carried forward (against £109,720 brought in).

Brown Brothers, Ltd.—In addition to a final dividend of 12½ per cent a tax-free jubilee bonus of 3 per cent is being paid out of the surplus from realization of investments, making the total distribution for the year 18 per cent (15 per cent). The net profit for the year was £142,094 (£114,292).

Waygood-Otis, Ltd., are paying a final dividend of 10 per cent (U.K. tax estimated at 8s.) against 15 per cent last year, making 20 per cent (25 per cent) for the year.

Aberdare Cables, Ltd., is paying a final dividend of 4 per cent, making 10 per cent for the year (against 6 per cent).

The Lancashire United Transport & Power Co., Ltd., is maintaining the year's distribution at 10 per cent by a final dividend of 6 per cent.

New Companies

Ardeeco Products, Ltd.—Registered January 21st. Capital, £1,000. Electrical and mechanical engineers and contractors, radio and television engineers, etc. Subscribers: J. M. Reeves and N. Field. Secretary: F. Dirs, 76, New Cavendish Street, W.1.

Gem Electrical Supply Co., Ltd.—Registered February 4th. Capital, £2,000. Directors: F. T. Dean, Elsie Dean and K. R. Stewart. Regd. office: Myrtle Cottage, Church Street, Stokenchurch, Bucks.

Whittaker Electrical Products, Ltd.—Registered January 28th. Capital, £1,000. To acquire the business of a dealer in wireless and electrical components now carried on by Ivor Whittaker at 195, King's Cross Road, W.C.1, as Whittaker Products. Directors: I. Whittaker and A. Whittaker. Regd. office: 195, King's Cross Road, W.C.1.

Alace & Co. (Electrical), Ltd.—Registered February 3rd. Capital, £1,000. Electricians, radio and electrical engineers, etc. Directors: Mildred A. Wight and A. Lace. Regd. office: Home Farm, Walkington, Beverley, East Yorks.

Bankruptcies

J. J. Jennison, residing at the Y.M.C.A., Dale End, Birmingham, and formerly carrying on business at Excise Chambers, Pelham Street, Nottingham, as an electrical contractor.—Trustee, Mr. A. Boaler, 5, Regent Street, Nottingham, released February 20th, 1947.

R. J. Thurlow, electrical engineer, 13, Bolton Lane, Ipswich, carrying on business at 27, Fore Street, Ipswich, as Electrical and Radio Repair Service.—Order made February 12th suspending discharge for nine months until November 12th, 1947.

Bertken Electrical Installations (a firm), 213, Boston Road, London, W.7, electrical engineers.—First meeting March 21st at 20, Eaton Place, London, S.W.1. Public examination May 9th at the Court House, Half Acre, Brentford.

Liquidations

Climax Radio Electric, Ltd.—Particulars of claims by April 9th to the liquidator, Mr. W. H. Parker, 90, Edgbaston Road, Smethwick, Staffs. All creditors have been, or will be, paid in full.

STOCKS AND SHARES

CONFLICTING influences make their effect felt upon Stock Exchange markets, although business is active, and, in spite of the various obstacles which might be supposed to curtail it, the volume of daily orders continues to be heavy. The gilt-edged market suffered from a nebulous impression that the Government might not be able to uphold its cheap money policy. This caused a certain amount of selling of high class stocks and shares in other markets. Falls were, however, of little consequence, and have been offset to some extent by advances elsewhere.

Price Fluctuations

British Aluminium rose 4s. 9d. to 48s. 3d. on the increase in the dividend from 8 per cent to 10 per cent for the year lately ended. The dividend on Ericsson Telephones, making 20 per cent free of tax for the year, had no particular effect upon the price, which remained about 50s. General Electrics eased off to 95s. De La Rue shares, now in their 5s. shape, lost 2s. 6d., receding to 72s. 6d. Electrical & Musical Industries went back 1s. 6d. to 24s. 9d. At 74s. 6d. Associated Electrical Industries show a fall of 1s. 9d. Murex eased off to 91s. 3d. Siemens at 36s. 6d. have gained the pence. Cable & Wireless ordinary went back 2 points to 155½, the weakness of British Government stocks probably leading to sales. Prices of Home Railway stocks, however, continued tolerably steady.

The electricity supply group gave way a trifle as a result of the dullness shown by the Consol market. Dividend distributions are generally satisfactory in nearly every department.

Government Climbs Down

One of the worst features in the compensation terms of the Transport and Electricity Bills is to be removed. This concerns the stocks carrying a Treasury guarantee under the Trade Facilities Acts. L.P.T.B. 3 per cent guaranteed stock, 1967-72, and North Metropolitan Power Station 5 per cent stock, 1957, are the securities so far affected. Originally the intention was to treat them on the same market-price basis as that applied to other stocks, the Treasury guarantee being evaded by an unconvincing legal interpretation of the contract. It has now been stated in Parliament that contractual rates of interest on guaranteed stocks will be met until the agreed date for redemption.

English Electric

English Electric shares have remained a steady market at 64s. since the full accounts were published earlier this month. They yield £3 2s. 6d. per cent on the distribution of 10 per cent, of which the final 6 per cent was paid on the capital as increased by the July issue of over a million ordinary shares at 57s. 6d., together with one-and-a-half million preference shares. Part object of that issue was the acquisition of Marconi's Wireless Telegraph capital. Included in the current accounts is the first dividend, amounting to £60,000 net, to be be received on that investment. In all, the company's net profit increased during the year by £50,000 to £493,000. The surplus available for distribution is equivalent to 16 per cent on the ordinary capital, and covers the dividend with over £100,000 to spare. With the backing of an impressive balance sheet, these results explain the modesty of the current yield.

Activity in Cossors

Persistent demand for A. C. Cossor shares has been a recent feature in industrial markets. From under 30s. at the beginning of the month, the price was run up to 37s., reacting later to 35s. An interim dividend is due; last year, the payment was 3 per cent, followed by a final of 7 and bonus of 2½ per cent, all tax free. On the total of 12½ per cent the gross yield at to-day's price would be about 3 guineas per cent. The buoyancy of Cossors has not spread to other shares in the same market. Deccas at 2⅞ are unchanged on the week.

South Americans Boom

The Argentine Government's determination to purchase the stocks of the British-owned Argentine railways has been followed by the anticipation that Brazil and other South American republics will proceed on similar lines in connection with railway and industrial companies in their countries. For these reasons, Argentine, Brazilian and other South American power and tramway issues have shot up in somewhat dramatic fashion. The buying is speculative since no official statements have been made to give rise to these great expectations, but rises of anything from 2 to 15 points have not been uncommon. Para Electric debentures, for instance, advanced 9 points one day last week, and Southern Brazil Electric 6½ per cents secured a similar gain in the same time. Anglo-Argentine Trams, Ceara Trams and Pernambuco bonds show very substantial improvements.

Domestic Appliance Production

A point raised in criticism of Government planning, concerns the relatively liberal retailing of domestic electrical appliances at a time when industrial requirements are already straining the capacity of generating stations. On the implications of this, in relation to the matter of priorities in the allocation of fuel and supplies, the market in the shares of the companies concerned is receiving a number of inquiries. The reply refers to the important contribution which appliances of this sort can make in the export field, and, also, to the fact that many of the makers are engaged to a greater extent in the production of industrial equipment. On balance, this factor is carrying little weight in the electrical equipment market.

Forthcoming Events

Monday, March 24th. — LONDON. — I.E.E. London Students' Section, 7 p.m. Three short papers on "Hydro-Electric Power Schemes." Joint meeting with London students of the I.C.E. and London Graduates of the I.M.E.

NEWCASTLE-ON-TYNE.—Neville Hall, Westgate Road, 6.15 p.m. I.E.E. North-Eastern Centre. "Industrial Applications of Electronic Techniques," by H. A. Thomas.

BIRMINGHAM.—James Watt Memorial Institute, Great Charles Street, 4 p.m. I.E.E. South Midland Radio Group. "The Elements of Wave Propagation using the Impedance Concept," by H. G. Booker.

Tuesday, March 25th.—LONDON.—Institution of Electrical Engineers (Radio Section). Radiocommunication Convention. March 25th-28th. (Additional meeting April 2nd).

Lighting Service Bureau, W.C.2, 7 p.m. Electrical Power Engineers' Association (London Technical Group). "Some Practical Applications of Electronics to Control and Measurements," by Dr. F. Brailsford.

Royal Society of Tropical Medicine and Hygiene, Mansion House, Portland Place, W.1, 7 p.m. Society of Instrument Technology. "Electronics in Non-destructive Testing," by R. Meakin.

MANCHESTER. — Engineers' Club, Albert Square, 3.30 p.m. Joint meeting of the North-Western Centre, North Midland Centre and Sheffield Sub-Centre of the I.E.E. "The Rehabilitation of Electricity Supplies—Italy," by Col. W. M. Lapper.

GLASGOW.—Royal Technical College, George Street, 6.15 p.m. I.E.E. Scottish Centre. "Colonial Telecommunication Systems," by C. Lawton and V. H. Winson. Joint meeting with Institution of Post Office Electrical Engineers.

COVENTRY.—Coventry Electric Club. "Electric Space Heating."

Wednesday, March 26th.—MANCHESTER.—Engineers' Club, Albert Square, 7 p.m. Junior Institution of Engineers (North-Western Section). "Inspection," by Major-Gen. A. W. Sproull.

Thursday, March 27th.—LIVERPOOL.—Philharmonic Hall, Hope Street, 6.30 p.m. I.E.E. Mersey and North Wales Centre. Faraday Lecture by J. Hacking.

Friday, March 28th.—RUGBY.—Corporation Electricity Showrooms, 6.45 p.m. I.E.E. Rugby Sub-Centre. "Power Supply for Generating Station Auxiliary Services," by W. Szwander.

LONDON.—Storey's Gate, St. James's Park, S.W 1, 5 p.m. Institution of Mechanical Engineers. Annual general meeting. "The Norwich Heat Pump," by J. A. Sumner and "The Air Cycle Heat Pump," by T. F. Thomas.

NEWCASTLE-ON-TYNE.—I.E.E. North-Eastern Students' Section. "The Place of the Engineer in the Post War World," by Sir Arthur P. M. Fleming.

NOTTINGHAM.—Greyfriars' Hall, 7 for 7.30 p.m. Nottingham Society of Engineers. Ladies' Evening.

Saturday, March 29th. — LONDON. — I.E.E. London Students' Section, 2.30 p.m. Visit to the power station of Fulham Borough Council.

Monday, March 31st.—LONDON.—Institution of Electrical Engineers, 5.30 p.m. Informal meeting. Discussion on "Developments in Fractional-Horse-Power Motors," opened by A. N. D. Kerr.

NEWCASTLE-ON-TYNE.—Royal Station Hotel, 6.15 p.m. I.E.E. North-Eastern Centre. Annual General meeting and conversazione.

Tuesday, April 1st.—CAMBRIDGE.—Cavendish Laboratory, 6.30 p.m. I.E.E. Cambridge Radio Group. "The Pulse Testing of Wide-Band Networks," by D. C. Espley, E. C. Cherry and M. M. Levy.

LEEDS.—Corporation Electricity Department, Whitehall Road, 6 p.m. I.E.E. North Midland Installations Group. "Modern Electric Lift Practice," by L. S. Atkinson.

MANCHESTER. — Engineers' Club, Albert Square, 6 p.m. I.E.E. North-Western Installations Group. "Coreless Induction Furnaces," by M. J. Marchbanks.

I.E.E. London Students

THE London Students' Section of the Institution of Electrical Engineers was honoured by a visit from the President, Mr. V. Z. de Ferranti, M.C., on March 4th, when he delivered his address entitled "The Engineer —Servant or Master." After commencing with an illustrated survey of the youthful years of the life of his father, Dr. S. Z. de Ferranti, he went on to emphasize that young engineers of to-day should seriously consider the advantages to be gained by setting themselves up as individual business men. The President stressed the point that in his opinion the modern engineer should not concentrate too much on the text book but rather on experience to be gained from conducting individual experiments.

Stress Analysis

THE recently formed informal Experimental Stress Analysis Group announces that its first conference will be held at University College, London, from March 25th to 27th. The programme includes an opening address by Professor J. F. Baker, of the University of Cambridge, on "Experimental Stress Analysis" and discussions on brittle lacquers, photo-elasticity and electric strain gauges. Further particulars can be obtained from the honorary secretary, Mr. E. K. Frankl, University of Cambridge, Department of Engineering, Trumpington Street, Cambridge.

NEW PATENTS

Electrical Specifications Recently Published

The numbers under which the specifications will be printed and abridged are given in parentheses. Copies of any specification (1s. each) may be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2.

ACE Electronics, Ltd., L. C. Welch and R. J Cook. — "Electrical impulse-counting apparatus." 5257. March 2nd, 1945. (585562.)

Aircraft-Marine Products, Inc.—"Tools for crimping a ferrule on to an electrical conductor." 27934/45. August 17th, 1942. (Divided out of 585508.) (585535.)

Britannia Batteries, Ltd., R. M. Blomfield and F. E. Burt.—"Alkaline electric batteries or accumulators." 3986. February 16th, 1945. (Addition to 564077.) (585302.)

British Thermostat Co., Ltd., and J. H. Sherlock.—"Thermostatic indicating devices for the control of electrically heated ovens and the like." 2689. February 2nd, 1945. (585502.)

British Thomson-Houston Co., Ltd.—"Wave guide structures." 3751/45. February 14th, 1944. (585290.) "Brazing alloys and methods of brazing." 26018/44. December 29th, 1943. (585493.) "Telemetering systems and apparatus therefor." 4563/45. February 25th, 1944. (585518.) "Induction type dynamo-electric machines." 4737/45. February 28th, 1944. (585524.)

British Thomson-Houston Co., Ltd., and W. J. Scott.—"Glass-to-metal seals." 4408. February 21st, 1945. (585324.) Electron-discharge devices of the velocity-modulation type employing resonating chambers." 961. January 22nd, 1942. (585336.)

British Thomson-Houston Co., Ltd., and J. E. Stanworth.—"Heat-resisting glass." 3575. February 13th, 1945. (585282.)

British Thomson-Houston Co., Ltd.—"Hydrolysis of organo-silicon halides." 13107/43. August 21st, 1942. (585626.)

British Thomson-Houston Co., Ltd. (General Electric Co.).—"Silicone resins." 2360. February 8th, 1944. (585628.)

Callender's Cable & Construction Co., Ltd., and P. V. Hunter.—"Electric cables." 32593. December 20th, 1939. (585446.)

E. K. Cole, Ltd., R. K. Spencer, F. Ellis and C. J. W. Newbery.—"Electric transformers, choke coils or the like." 4093. February 19th, 1945. (585308.)

A. C. Cossor, Ltd., and A. H. A. Wynn.—"Thermionic valve amplifiers." 18610. September 28th, 1944. (585482.)

J. A. Crabtree & Co., Ltd., and J. A. Crabtree.—"Plugs for electric couplings." 4947. February 27th, 1945. (585547.)

T. A. Edison, Inc.—"Resistor bulb." 9374/44. July 8th, 1943. (585407.)

Electric Furnace Co., Ltd., F. G. Connor, E. K. Benson and L. C. Collyer.—"Apparatus for the continuous heat treatment of metal bars." Cognate applications 13123/44 and 23212/44. July 10th, 1944. (585416.)

Ericsson Telephones, Ltd., and D. C. Crowe.—"Electrical contact-making devices." 4750. February 26th, 1945. (585525.)

G. E. F. Fertel, R. W. L. Batt and C. S. Wright. — "Electric measuring apparatus." 10958. June 7th, 1944. (585471.)

D. C. Gall.—"Valve amplifiers." 14973. August 4th, 1944. (585419.)

General Electric Co., Ltd., and A. H. Roden.—"Apparatus for electric arc welding or cutting." 12020. August 26th, 1942. (585387.)

General Electric Co., Ltd., and J. B. S. Smyth.—"Lighting fittings." 5239. March 2nd, 1945. (585561.)

Harland Engineering Co., Ltd., and L. Greenwood.—"Dynamo-electric machines of the submersible type." 4862. February 27th, 1945. (585542.)

Landis & Gyr Soc. Anon.—"Maximum-demand metering device." 25627/44. December 24th, 1943. (585383.)

H. Lindars and C. H. Smith.—"Electrical timing devices." 17619. September 14th, 1944. (585373.)

K. C. Lowe.—"Tubular electric lamp fittings." 4337. February 21st, 1945. (585320.)

D. M. Mackay and C. S. Wright.—"Electric power supply systems." 19749. November 26th, 1943. (585464.)

Marconi's Wireless Telegraph Co., Ltd., and E. Green.—"Equi-signal radio beacons." 1570. January 27th, 1944. (585393.)

Marconi's Wireless Telegraph Co., Ltd.—"Electric frequency responsive circuits." 7855/44. April 27th, 1943. (585588.) "Method of manufacturing filamentary cathodes." 12217/44. February 24th, 1943. (585604.)

Mawdsley's, Ltd., A. H. Topham, C. W. H. Minchin and N. W. Jones.—"Dynamo-electric machines." 9710. May 19th, 1944. (585410.)

Metropolitan-Vickers Electrical Co., Ltd., and E. B. Moullin.—"Barriers non-reflectant to incident electro-magnetic waves." 4104. March 12th, 1943. (585460.)

Metropolitan-Vickers Electrical Co., Ltd., G. C. Collins and T. F. Monahan.—"Electric measuring arrangements." 3490. February 12th, 1945. (585278.)

C. J. Nardon.—"Cable terminal." 14457/44. September 13th, 1943. (585418.)

Philips Lamps, Ltd., A. Nemet and M. Berindei.—"Electro-therapeutic impulse generators." 24045. December 1st, 1944. (585650.)

A. Reyrolle & Co., Ltd., and W. G. Johnstone.—"Electric distance protective arrangements." 4512. February 22nd, 1945. (585516.)

H. H. Richards.—" Means for supporting the flexible cable of electric irons or like appliances." 23061. November 20th, 1944. (585646.)

D. Rushworth.—" Self-winding cable reels." 5078. March 1st, 1945. (585554.)

R. Sarazin.—" Machines for electric arc welding." 9300/40. May 23rd, 1939. (585327.)

Siemens Bros. & Co., Ltd., and D. P. Long.—" Automatic telephone systems." 920. January 11th, 1945. (585495.)

Siemens-Schuckert (Great Britain), Ltd., and S. Flax.—" Portable flameproof electrical switchgear." 4817. February 26th, 1945. (585532.)

Smart & Brown (Engineers), Ltd., W. H. Spivey and P. J. Packman.—" Electrical contact terminals and switches." 4133. February 19th, 1945. (585310.)

Standard Telephones & Cables, Ltd.—" Telegraph code recorders." 20959/44. February 11th, 1944. (585433.)

Standard Telephones & Cables, Ltd., and J. Foster.—" Electron discharge tubes." 7493. June 13th, 1941. (585448.)

Standard Telephones & Cables, Ltd., and F. D. Goodchild.—" Electron discharge devices." 15507. December 2nd, 1941. (585451.) "Electric-discharge devices." 16436. December 19th, 1941. (585453.) " Electron-discharge devices." 3377. March 13th, 1942. (Addition to 585451.) (585455.)

Standard Telephones & Cables, Ltd., and F. H. Taylor.—" Electron-discharge devices for use at ultra-high frequencies." 4747. March 23rd, 1943. (585461.)

Standard Telephones & Cables, Ltd., and S. G. Tomlin.—" Ultra-high-frequency amplifiers." 6073. May 10th, 1941. (585447.)

Standard Telephones & Cables, Ltd., and J. D. Weston.—" Thermionic valve circuits." 16723. September 1st, 1944. (585478.)

Standard Telephones & Cables, Ltd., and E. O. Willoughby.—" Ultra high-frequency transmission lines and amplifiers for use therewith." 6276. April 19th, 1943. (585462.) " Detector circuit arrangements for use at high radio frequencies." 14700. August 1st, 1944. (585473.)

Standard Telephones & Cables, Ltd., J. Foster and G. E. Ford.—" Electron-discharge devices." 8476. June 19th, 1942. (585457.)

Standard Telephones & Cables, Ltd., F. D. Goodchild and W. H. Wolsey.—" Electron-discharge tubes." 13728/9. October 24th, 1941. (585449/50.) " Electron-discharge devices." 15508. December 2nd, 1941. (Addition to 585449.) (585452.) " Anodes of electric discharge tubes." 16438. December 19th, 1941. (Addition to 585450.) (585454.)

Standard Telephones & Cables, Ltd., S. G. Tomlin and J. Foster.—" Electron-discharge devices." 7713. June 5th, 1942. (Addition to 585448.) (585456.)

Standard Telephones & Cables, Ltd., S. H. Towner and P. A. Childs.—" Lifting pins for electromagnetic relays." 7994. April 28th, 1944. (585401.) " Electromagnetic relays." 5079/46. April 28th, 1944. (Divided out of 585401.) (Addition to 566778.) (585444.) " Contact spring pile-ups particularly for electromagnetic relays." 5080/46. April 28th, 1944. (Divided out of 585401.) (585445.)

Standard Telephones & Cables, Ltd., and W. A. Beatty.—" Arrangements for determining distances by reflection of electricity pulses." 16434. December 19th, 1941. (585568.)

Standard Telephones & Cables, Ltd., and C. W. Earp.—" Super-regenerative receivers for electromagnetic waves." 17731. September 15th, 1944. (585613.)

Standard Telephones & Cables, Ltd., and W. A. Montgomery.—" Thermionic frequency mixing arrangements." 12504. September 26th, 1941. (585570.)

A. H. Stevens (Gibson Electric Refrigerator Corporation).—" Evaporators, refrigerators including the evaporator, and method of manufacturing the evaporator." 16622. October 11th, 1943. (585463.)

Telegraph Condenser Co., Ltd., and G. J. Hawes.—" Electrical condensers." 15021. August 8th, 1944. (585474.)

Thermega, Ltd., and S. A. Singleton.—" Electric snap action switches." 8351. May 3rd, 1944. (585590.)

F. W. Thorpe, Ltd., and F. W. Thorpe.—" Fluorescent electric lighting fittings." 3627. February 13th, 1945. (585283.)

Venner Time Switches, Ltd., and W. F. Horgan.—" Electrical high-tension impulse apparatus." 18721/3. September 29th, 1944. (585617/9.)

Western Electric Co., Inc.—" Electric pulse generators." 5936/44. October 1st, 1942. (585359.)

Westinghouse Electric International Co.—" Gear drives." 7357/44. May 28th, 1943. (585399.) " Electronic control systems suitable for capacitor discharge welding systems." 22802/44. November 24th, 1943. (585437.) " Power plants." 6873/44. February 3rd, 1943. (585509.)

Wilmot-Breeden, Ltd., and F. V. Lewis.—" Electric switches for controlling vehicle direction indicators." 4776. February 26th, 1945. (585529.)

Amended Specifications Published

563080. A. H. Hunt, Ltd., and another.—" Metallized paper electric condensers."

565323. O. K. Kolb.—" A.c. current rectifiers of the selenium type."

578208. Standard Telephones & Cables, Ltd.—" Method of making selenium elements."

Sussex Industries Exhibition

The second Sussex Industries Exhibition is ot be held at Brighton from September 17th to 27th. Particulars may be obtained from Lt. Col. C. H. Briggs, 3, Marlborough Place, Brighton, 1.

CONTRACT INFORMATION

Accepted Tenders and Prospective Electrical Work

Contracts Open

Where "Contracts Open" are advertised in our "Official Notices" section the date of the issue is given in parentheses.

Bath.—March 31st. City Council. Supply and delivery of materials for twelve months commencing June 1st, 1947. (March 7th).

Belfast.—April 3rd. Electricity Department. 33-kV armourclad switchgear. (March 14th.)

Birkenhead.—April 5th. Electricity Department. Transformer kiosks. (See this issue.)

Bolton.—April 12th. Electricity Department. Supply for twelve months of transformers ranging from 100 to 1,500 kVA. (March 14th.)

Bradford.—April 22nd. Corporation. Three-phase static transformers. (See this issue.)
Two 350-kW glass bulb type mercury arc rectifiers. (See this issue.)

Bury.—April 9th. Electricity Department. One 5,000-kVA transformer. (March 14th.)

Dewsbury.—April 4th. Electricity Department. 11-kV cables and four 500-kVA transformers. (See this issue.)

Erith.—April 14th. Electricity Department. Materials and apparatus for the period ending March 31st, 1948. (See this issue.)

Farnworth.—April 1st. Electricity Department. E.h.v. and l.v. cables, pillar boxes and underground boxes. (March 14th.)

Glasgow.—April 11th. Corporation Water Department. Plant for new pumping station at Buchley Farm, including four electrically-driven centrifugal pumps. General manager, Water Department, City Chambers.

Heston and Isleworth.—April 14th. Electricity Department. One 500-kW rectifier equipment. (See this issue.)

Leyton.—April 2nd. Electricity Department. Cables and meters for one year. (March 7th.)

Middlesbrough. — April 26th. Electricity Department. One 11,000-V ring main unit, one 250-kVA transformer and one meter testing set. (March 14th.)

Newark.—April 21st. Corporation. 11-kV ring main unit and l.v. switchboard. (See this issue.)

Plymouth.—April 12th. Electricity Department. Six ash conveyor belts. (See this issue.)
One 30-in. bore, circulating water inlet valve. (See this issue.)

Orders Placed

Bradford.—Housing Committee. Accepted. Electrical installations in 96 houses, Buttershaw (£2,888) and in 20 houses, Eccleshill (£514).—J. Pierson.

Ilford.—Electricity Committee. Accepted. Distribution panels (£251 each).—W. Lucy & Co. Switchboards (£3,990).—A. Reyrolle & Co. Cable (£297).—Metropolitan Electric Cable & Construction Co.

Contracts in Prospect

Particulars of new work and building schemes for the use of electrical installation contractors and traders. Publication in this section is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Alnwick.—Houses (22) at Embleton; R.D.C. architect.

Aspull.—Houses (36), Crawford Estate, for U.D.C.; J. Winstanley, builder, New Springs, near Wigan.

Belper.—Houses (26), Danesby Crescent, Denby, for R.D.C.; H. Hunt & Sons, builders, Nottingham Road, Ripley.

Bognor Regis.—Houses (72), Waterworks Depot site, for U.D.C.; Steanes (Bournemouth), Ltd., builders, Bournemouth.

Bollington.—Houses (54), Grimshaw Lane, for U.D.C.; W. Dobson Chapman & Partners, architects, Jordangate, Macclesfield.

Bredbury and Romiley.—Houses (50) for U.D.C.; G. A. Lomas & Co., Ltd., builders, Stockport.

Brierley Hill.—Houses (58), Tack House Farm Estate, Wordsley, for U.D.C.; Eadie & Co. (Wolverhampton), Ltd., builders, 29, Waterloo Road, Wolverhampton.

Brighton.—Houses (72) and flats (28), Parkside Estate (£116,040), for T.C.; C. H. Coates, Ltd., builders, Davies Road, Surbiton.

Bromsgrove.—Houses at Clent and Hagley for R.D.C.; Folkes & Folkes, surveyors, 34, Hagley Road, Stourbridge.

Crewe.—New works; British Rollmakers, Ltd., Horseley Fields, Wolverhampton.

Darlington.—Technical block and canteen, West Auckland Road, for the Chemical & Insulating Co., Ltd.

Durham.—Extensions and new buildings at St. Mary's College and Hatfield College; J. Jackson & Sons, Corporation Street, Newcastle-on-Tyne.

East Ham.—Dwellings (81), Langdon Estate, Lonsdale Avenue, High Street South and Eastbourne Road; chief housing officer, Town Hall.

Gateshead-on-Tyne.—Extensions to the administrative block of the Queen Elizabeth Hospital; borough engineer, Town Hall.

Glamorgan.—Dining halls at 26 county schools (£200,000); county architect, County Hall, Cardiff.

Hackney.—Reinstatement Sigden Road school (£30,289); J. Chapman & Sons, Ltd., Leicester.

Halesowen.—Houses (22), Hasbury Farm Estate, for T.C.; John Harris & Sons (Blackheath), Ltd., 159, New John Street, Blackheath.

Hebburn (Co. Durham).—Additions to offices for Palmers Co., Ltd.; Purdie, Lumsden & Co., Ltd., builders, Oxford Street, Newcastle-on-Tyne.

Heston and Isleworth.—Primary school, Hounslow West Estate (£70,880); Middlesex county architect, London.

Ilford.—Houses (58), Cheriton Road (£1,303 each); New Ideal Homesteads, Ltd.

Isle of Axholme.—Dwellings (54), Epworth, Haxey, and Owston Ferry, for R.D.C.; S. W. Chester, clerk, The Gables, Epworth, Doncaster.

Jarrow-on-Tyne.—A factory block (to include six factories of the smaller type) at the Bede Trading Estate; Cackett, Burns Dick & McKellar, 21, Ellison Place, Newcastle.

Larne.—New radio factory for Corran Works, Ltd.

Littlehampton.—Hospital extensions, Fitzalan Road; Goldsmith & Pennell, architects, Worthing.

Loughborough.—Factory at Shepshed for Aircraft Spares & Repairs, Ltd.

Merthyr.—Bakery at Cyfarthfa for D. Jones Dickinson & Co., Ltd.

Middlesbrough.—Additions to stores, Linthorpe Road, for F. W. Woolworth & Co., Ltd.; own architects.

Factory, Cargo Fleet Road, for Cleveland Products, Ltd.; G. P. Stainsby, architect, 25, High Street, Stockton-on-Tees.

Morpeth.—Houses (70) for Town Council; E. Jeffock, Walbottle Road, Newburn-on-Tyne.

Newcastle-on-Tyne.—Bus station for the City Council; city engineer.

Maternity unit at the General Hospital for the City Council (£105,000); H. Kindred, builder, West Road.

Extension of the foundry of St. Peter's Foundry Co., Ltd., Walker Road; plans by company's own staff.

Newry. — New factory (£300,000) for Horrockses, Crewdson & Co., Ltd.

North Riding. — Schools at Newby Wiske, Northallerton and Bedale; county architect, County Hall, Northallerton.

North Shields.—Alterations and improvements to the Newcastle Savings Bank premises; B. Peel, Ltd., East Mill Works.

Northumberland.—Alterations and improvements to staff quarters at Hexham Emergency Hospital for the C.C. (£3,865); county architect, County Hall, Newcastle-on-Tyne.

Nottingham.—Bus garage (£160,000); borough engineer.

Nuneaton.—Factory at Weddington for L. G. Sinsbury, Ltd.

Pontnewydd.—Extensions to works for Redbrook Tin Stamping Co.

Port Sunlight.—Extensions to works for Lever Bros., Ltd.

Preston.—Junior and infants' school, Ashton and Lea, for Lancashire E.C.; Sir John Burnet, Tait & Lorne, architects, 1, Montagu Place, London, W.C.1.

Rhyl.—Permanent houses (31), Marsh Road; U.D.C. surveyor, Council Offices.

Rothwell.—Houses (64), Bondfield Terrace; U.D.C. architect, Civic Buildings, Rothwell.

Salford.—Rebuilding portion of Town Hall (£24,000); borough engineer.

Southport.—Houses (50), Radnor Drive and Lytham Road; borough engineer, Town Hall.

South Shields.—Factory, Bede Estate, for H. Mullins; Spence & Price, architects, Haldane Terrace, Jesmond, Newcastle-on-Tyne.

Factory, Bede Estate; J. W. Hanson & Son, architects, 123, Northumberland Street, Newcastle-on-Tyne.

Stockton-on-Tees.—Houses (64) on the Darlington Lane Estate for the T.C.; Moorhouse & Barker, builders, Thornaby-on-Tees.

Stone.—Extensions to factory for Lotus, Ltd., Stafford.

Sunderland.—Factory, Nile Street, for Embossers, Ltd.; J. Huntley & Sons, builders, Marion Street.

Garage, Stockton Road, for the Northern General Transport Co., Ltd., Chester-le-Street.

Furniture factory at Pallion for J. Linskill; H. E. Pitt, Ltd., Leopold Street, Millfield.

Sunningdale.—Houses (42), Rise Road; Sainsbury & Chamberlain, architects to R.D.C., 14, Cross Street, Reading.

Taunton.—Factory for Steel & Glover, Ltd., Thomas Street.

Tynemouth.—Houses (42) on the Broadway site for the T.C.; A. E. Appleton, builder, North Shields.

Additions at Brewhouse Bank for Tyne Brand Products, Ltd.; Tasker & Child, architects, Trinity Buildings, New Bridge Street, Newcastle-on-Tyne.

Uxbridge.—Factory at Uxbridge Moor for Conslab, Ltd.

Wallsend.—Garage and office, Oak Grove, for R. Dodds & Son; J. H. Morton & Son, architects, Westgate Road, Newcastle-on-Tyne.

Walsall.—County school, Dudley's Fields (£78,000); borough engineer.

Wrexham.—Houses (86) on three sites; D. E. Edwards, R.D.C. surveyor, Imperial Buildings.

York.—Houses (94) between Water Lane and Rawcliffe Lane; Charles J. Minter, city architect, Guildhall.

Wolverhampton.—Blocks of flats (21), for aged and single persons, Bushbury; director of housing, Town Hall.